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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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CONTENTS

Volume 9 June 1976 No. 6

Page

General 377
(News items, letters, and editorials appearing in scientific and technical journals; information on production and use; and other items of general interest)

Monitoring and Residues 381
(Levels of pesticides in people or nonexperimental animals or in water, air, soil, food, feed, and other consumer products)

Epidemiology, Prevention and Treatment 395
(Frequency and distribution of pesticide poisoning in man or nonexperimental animals and treatment of clinical cases; morbidity and mortality; safety measures; decontamination; disposal of containers and wastes; legislation and regulations)

Toxicology and Pharmacology 405
(Toxicity studies in man and animals; effects on cells; organs, and systems; metabolic studies, biochemistry, interactions; antidotes and other treatment; mode of action. Ordinarily, articles dealing with efficacy studies are not included.)

Analysis 432
(Preparation of samples; analytical methods; instrumentation

Quarterly Index, April-June
Preface 439
Subject Index
I. Concepts 440
II. Compounds 452

Author Index
Personal 471

76-1344. Croft, B. A.; Brown, A. W. A. (Pesticide Res. Cent., Michigan State Univ., East Lansing, MI 48824). **Response of arthropod natural enemies to insecticides.** *Annu. Rev. Entomol.* 20: 285-335; 1975. (246 references)

The available data on the direct toxicity of insecticides to natural enemies of the arthropods is reviewed, as are the indirect effects arising from secondary poisoning through the prey or pest species. The list of natural enemies that have developed resistance to insecticides includes only nine species, five of which are phytoseiid mites; of the remainder, two are braconid parasites in which resistant strains have been produced by laboratory selection, and two are resistant species of predatory insects which occurred in nature. Factors governing the development of resistance in natural enemies are discussed; probably the most significant element in relation to the action of insecticides on natural enemies is linked with the additional stress imposed by the virtual elimination of their food source. The application of this data to principles and practice is considered with respect to insecticides and acaricide selectivity, manipulations of a natural enemy complex, resistant natural enemies in pest management, and the long-term dynamics of insecticide resistance. It may be concluded that although economic thresholds for pests will continue to be dictated on the grounds of acceptable damage, some consideration should be given to ensuring that sufficient numbers of prey or hosts remain to serve as food for the resistant genotypes of natural enemies surviving the applications.

76-1345. Ebing, W. (Biol. Bundesanstalt Land-Forstwirtschaft, Inst. Pflanzenschutzmittelforsch., Berlin-Dahlem, Germany). **Belastung des Areals der Bundesrepublik Deutschland einschliesslich Westberlins durch tatsaechlich ausgebrachte Herbizidmengen sowie Erfassung der beobachteten unerwuenschten Nebenwirkungen. [Inquiry about herbicides emitted into the area of the German Federal Republic including West Berlin and their side effects observed in field practice.]** *Ber. Landwirtsch.* 51(4): 742-755; 1974. (German)

Statistical data is presented on the amounts of herbicides distributed on farmlands, orchards, and gardens in West Germany and West Berlin in 1972. Data is also given on areas treated with herbicides and on the damage caused by these herbicides. TCA, dichlobenil, chlorthiamid, atrazine, mecoprop, triallate, dichlorprop, dinoseb, and pyrazon were the most commonly used herbicides in 1972. Herbicide-inflicted injuries and side effects included massive death of bees due to DNOC, malformations of cereals due to a combination of mecoprop and 2,4-D, and damage to beet and clover plants by MCPA and MCPB.

76-1346. Butrico, F. A. (Author address not given). **El control de la calidad del ambiente: un esfuerzo nacional. [Environmental quality control as a national effort.]** *Bol. Of. Sanit. Panam.* 30(1): 1-10; 1976. (2 references) (Spanish)

In a general survey on environmental pollution control the establishment of national policy and monitoring programs with definite norms and monitoring criteria are first recommended. The U.S. Environmental Protection Agency is mentioned as having originated the PDI (Prevalence-Duration-Intensity) index for the quality control of water pollution. The establishment of institutions and agencies and their relationship with the industrial and economic development and the awareness of the general public is discussed. DDT is briefly mentioned as a substance with debatable characteristics, since some data appears to demonstrate its carcinogenic effects, while other studies demonstrate that in some of its forms it may inhibit adrenal cancer. It may remain for several years in the environment or it may decompose rapidly. It is considered a menace by some, while others advocate its use in the control of malaria and encephalitis.

76-1347. Bovey, P. (Author address not given). **Incidence des traitements pesticides sur les zoocenoses forestieres. [Persistent pesticide use and effects on forest ecosystems.]** *Bull. Soc. Zool. Fr.* 99(1): 9-18; 1974. (21 references) (French)

The extensive use of organochlorine pesticides, especially DDT, to control forest pests has led to noxious effects: selection for resistant strains, more or less serious ecological imbalance, and the accumulation of toxic residues in the food chain. Useful entomophagous insects have been eradicated and wildlife, especially birds, has been affected. No less than 330 species of harmful insects and acaridae have acquired resistance; 1/3 of these are a threat to human health and 2/3 are agricultural pests or domestic animal parasites. Recently, a view of problems with chemical utilization and the limits of conventional biological warfare, research has turned to sexual pheromones, Scolytid aggregation pheromones, juvenile hormones, and antifeeding substances. In most cases, DDT has been replaced by organophosphorus compounds which are all more or less toxic to warm blooded animals and to man but are quickly degraded and do not pollute the environment in the long run. However, the use of organophosphates for generalized forest treatments is contraindicated by the need for more specific insecticides. Zectran (mexacarbate), developed in the United States, seems to fill all the requirements for the replacement of DDT and to be especially effective against *Choristoneura fumiferana* and *C. occidentalis* at a dose ten times less than that of DDT (130 g/ha). Preventive research needs better knowledge of the relations between the pest, its host plant, and the physical and biological milieux. Forestry-related measures should encompass a careful choice of plant species with regard to their adaptation to the soil and climate, the use of manure in low nutrient soils, the use of cultivation methods which produce the least alterations of the forest environment, as well as the possibility of establishing naturally resistant species.

76-1348. Ramade, F. (Lab. Zool., Univ. Paris-Sud, Paris, France). **La pollution par les pesticides et ses consequences ecologiques pour la faune sauvage. [Pesticide pollution and its ecological implications for wildlife.]** *Bull. Soc. Zool. Fr.* 99(1): 19-25; 1974. (24 references) (French)

Pesticide pollution is occurring on a worldwide scale, not only in agricultural areas directly exposed to dispersals, but also in soils, air, and water from remote areas. Like radioactive fallout, pesticide compounds move through different regions of the biosphere and accumulate in the biomass at all trophic levels. Accordingly, biological effects should be considered at each one of these levels, not only at cellular, organic, and individual ones, but also at those of populations and whole communities. Man is in a particularly bad position since he can be exposed to rather high concentrations of contaminants by being at the top of the ecological scale.

76-1349. Pesson, P. (Lab. Zool., Biol. Anim. Ecol., Paris, France). **Comment ameliorer la lutte chimique contre les insectes ou par quoi la remplacer? [Recent advances in non-chemical pest control.]** *Bull. Soc. Zool. Fr.* 99(1): 63-72; 1974. (French)

Using pesticides of more specific action is improving chemical pest control by reducing the level and number of insecticide treatments. Specificity can be imparted by utilizing systemic insecticides which are ingested only by phytophagous insects or by adding to the insecticide substances which attract specific insects. These substances are extracted either from plants (food attractants) or from the insects themselves (especially sexual attractants). Research on pheromones has led to the synthesis of a number of compounds with specific action. To prolong the attractive action of these compounds, antioxidant additives are being tried. Entomologists are trying to replace toxic compounds with highly biologically active substances such as hormones controlling moulting, metamorphosis, ovogenesis, or any other essential physiological phase. The juvenile hormone has been the focus of this research, and has led to the development of "third generation" insecticides. Terpenoid aromatics are being studied for their effects on the growth of eggs or larvae, fecundity, and fertility. Some of the synthesized compounds have synergistic activity when combined with the insecticides, or effects comparable to those of chemosterilants. Research is also geared toward developing strains of plants resistant to insects, such as the very successful import of American strains of *Vitis vinifera* resistant to phylloxera.

76-1350. Kasowski, M. A.; Kasowski, W. J. (Author address not given). **Lead in the environment: sources of danger.** *Can. Med. Assoc. J.* 114(5): 474,476; 1976. (6 references)

Environmental contamination by lead is evident even in the remotest parts of the globe. Sources of contamination include automotive exhaust emissions, stack plumes and other fugitive dusts from industrial sources, surface contamination of vegetation, lead based paint, the daily diet, lead-glazed pottery used in the preparation or storage of food, lead-soldered kettles, and lead solder used in the canning process for evaporated milk, fruit juices, and soft drinks. Lead arsenate used as an insecticide poses a serious potential hazard. While agricultural use has generally declined, it is still popular among eastern apple growers. A critical health hazard may also result from high concentrations of lead occurring in microenvironments, as when lead-containing insecticides are carelessly discarded in areas where animals graze or children play.

76-1351. Mauro, A. (Lab. Chim. Prov. Ig. Profil., Catanzaro, Italy). **PCB (policlorobifenili) ed ambiente. [PCBs (polychlorobiphenyls) and the environment.]** *Ind. Aliment. (Pinerolo, Italy)* 13(11): 97-100; 1973. (4 references) (Italian)

PCBs are chemically inert synthetic products; they are practically insoluble in water but easily dissolved in hydrocarbons and fats. They are not subject to hydrolysis in water and are resistant to heat, alkalis, acids, and chemical agents in general. They have a low volatility and do not decompose when distilled. When burned, they form oxidized products, the acute toxicity of which is far superior to that of the initial substance. Common incineration products include polychlorodibenzofurans. Although their presence complicates the study of the toxicity of PCBs, it is certain that PCB toxicity is related to chlorine content; PCBs with the lowest chlorine contents are thought to affect animal reproduction, while those with higher chlorine concentrations will affect the liver. PCB residues were measured in various organs of birds killed by PCB poisoning. Results varied widely. PCB chronic toxicity was determined to be 1/5 of that of DDT. In mammals, the liver, the heart, and the kidneys are affected, and in birds, the spleen becomes atrophied. To determine genetic effects on the offspring of chronically intoxicated animals, rats and rabbits were fed varying doses of PCBs; the birth rate fell in rats, and toxic effects were noted in the rabbit embryos. In contaminated hens, the egg-laying rate decreased and mortality of chicks still in the shell increased. Offspring weighed much less than the chicks of normally fed hens. In a group of 300 Japanese who had ingested rice oil contaminated with 200 ppm of PCB, there were no deaths due to the low acute toxicity, but skin dangers, fatigue, vomiting, and swelling occurred. PCB levels in the blood reached 75 ppm. Of 13 pregnancies in intoxicated mothers, 11 resulted in live deliveries; 10 of the infants had grey-brown skins, and 9 had excessive lacrimation. Most of them were smaller than the national average.

76-1352. Rubtsov, I. A. (Zool. Inst., Acad. Sci. USSR, Leningrad, USSR). **Biologicheskiye metod bor'by s vreditelyami v programme MBP. [Biological methods of pest control in the MBP Program.]** *Izv. Akad. Nauk SSSR Ser. Biol.* 6: 799-810; 1974. (21 references) (Russian)

Studies have been made of the possible use of

biological control to fight four groups of pests: aphids, coccids, codling moth, and tetranychus ticks. During the studies attention was given principally to the question of rational utilization of natural enemies. This paper offers a short review of various studies conducted in the USSR relating to the plan of the subsection of biological control under the plan of the Soviet MBP (International Biological Program.)

76-1353. Deshpande, W. M. (Visvesvaraya Reg. Coll. Eng., Nagpur, India). **Environmental pollution due to pesticides.** *J. Inst. Eng. (Calcutta)* 56(1): 23-25; 1975. (11 references)

Synthetic organic chemicals are most important pesticides in view of their rate of growth and their potential for environmental contamination. Over-application commonly compounds the problem of environmental contamination. Although extensive data is available on pesticide contamination of the food, soil and water, very little data is available on contamination of the air. More data is needed concerning the methods of reducing pesticide contamination and the effects of pesticide residues on man and other forms of life. Crops grown on contaminated soil may be harmed and there may be harmful effects on soil organisms. Persistence of pesticides in soil depends on the type of pesticides, soil type, soil temperature, wind or air movement, cover crops, method of application, and other factors. Some chemicals such as organophosphorus insecticides are oxidized in soil to toxic metabolites. Pesticides contaminate surface and ground waters by spray deposition runoff from treated areas, percolation through the soil to ground waters, and other ways. Low pesticide levels are present in drinking water. However, no evidence exists at present to show that long term consumption of such water would produce harmful effects. Pesticide dusts and aerosols contain particles as small as 5μ, and some such particles remain suspended in air. They may then be inhaled or may come in contact with the skin. Generally the hazard to mammals is greater if the pesticide is inhaled.

76-1354. Misato, T. (Inst. Phys. Chem. Res., Wako, Saitama, Japan). **[Problems in evaluation of pesticide safety.]** *Kagaku To Kogyo (Chem. Chem. Ind.)* 29(3): 217-220; 1976. (2 references) (Japanese)

Some major problems in evaluating the safety of pesticides are discussed. Safety is related to the nature, the quantity, and the application method of the pesticide. The toxicity of pesticides is rigorously tested in Japan. Questions are raised concerning the chronic toxicity test, in which the candidate pesticide is given at much higher levels than those actually ingested by human beings, domestic animals, and wild life. It is proposed that the safety of pesticides should be evaluated on the basis of levels to which human beings are exposed, and that there is a world-wide necessity for the establishment of international pesticide and residue standards in human foods and in feed for domestic animals.

76-1355. Goto, S. (Inst. Environ. Toxicol., Tokyo, Japan). **[Problems of pesticide residues.]** *Nippon Noyakugakkai Shi* 1(1): 57-67; 1975. (32 references) (Japanese)

Cases of pesticide residues which have become social problems, such as mercury in brown rice, BHC (especially β-BHC) in cow's milk, and dieldrin and other polychlorocyclodienes in vegetables due to residues in farm soil, were described. Countermeasures taken by the Ministry of Agriculture and Forestry are explained. These include countryside surveys and investigations of pesticide residues in agricultural crops, in farm soil, and in animals. Some recently developed methods for determining pesticide residues (systematic analysis, high speed liquid chromatography and mass fragmentography, etc.) were introduced. Stress is placed on the necessity for a total diet study of foods, which has not yet been done in Japan.

76-1356. Kiritani, S. (Kochi Prefect., Japan). **[Pesticides for agriculture and the ecosystem.]** *Nippon Noyakugakkai Shi* 1(1): 69-75; 1975. (49 references) (Japanese)

The concept that pesticides are a panacea for agricultural problems is criticized. Side effects of pesticide use include extermination of natural enemies and competing species resulting in the change of latent pest insects to actual pests, development of resistance towards pesticides, presence of pesticide residues in crops and soil, and environmental pollution which reduces wildlife and disturbs biological balance. Pesticides affect not only agro-ecosystems, but also the general ecosystem. The concept of *K*-strategists and *r*-strategists, changes of pests and natural enemies in paddy fields, disturbance of the entomological balance, and differences in resistance between pests and natural enemies were discussed as related to the agro-ecosystem. Items interpreted as general ecosystem problems were: differences in the toxicity of a pesticide; biological accumulation of highly diluted pesticides; effects of sublethal amounts of pesticides; and toxicity of metabolites or degradation products of pesticides. The necessity for proper use of pesticides and their evaluation in a management system based on diversity, stability, and productivity was stressed.

76-1357. Veylon, R. (Author address not given). **Les virus relais des insecticides dans la lutte contre les insectes nuisibles et vecteurs de maladie. [Insecticidal viruses in the fight against harmful and disease-bearing insects.]** *Nouv. Presse Med.* 3(37): 2427-2430; 1974. (French)

The use of entomoviruses as insecticides raises a number of questions requiring research. Their safety is supported by the lack of adverse effects in birds and other insectivores which have eaten infected insects and in animals which have consumed infected vegetable foods.

However, antibodies against certain entomoviruses have been frequently found in a number of vertebrate species and in laboratory workers. The extent to which non-target organisms could be affected will depend on the extent of propagation of the virus, possible dispersion, movements of the parasites or of the affected insects, wind and rain factors, body temperature, and age and type of animal. The virus can enter the organism by the respiratory and digestive tracts and can also affect external parts such as the skin and the eyes. A man with an inhalation rate of 10 liters per minute and with a 30 minute exposure to aerosols will run risks of infectious contamination if an infectious risk is that of pneumopathy leading to progressive pulmonary fibrosis. Massive exposure could have effects of viral origin or due to the adjuvants. Safety measures should include preliminary experimentation for a minimum of 6 years, consisting of microbiological proofs of safety, limited trials on the soil, and eventual large scale trials. The crucial question is whether the entomovirus being studied is capable of infecting vertebrate cells.

76-1358. Fernandez Garcia, I. (Dep. Anal. Chem., Fac. Sci., Univ. Santiago, Compostela, Spain). **Determinacion de residuos de plaguicidas organoclorados de leche.** [**The determination of organochlorine pesticide residues in milk.**] *Acta Cient. Compostelana* 10(1): 37-43; 1973. (12 references) (Spanish)

The presence of *p,p'*-DDT, *o,p'*-DDT, *p,p'*-DDE, *p,p'*-TDE, γ-BHC, and α-BHC was investigated in 100 samples of pasteurized cow's milk (PCM), natural cow's milk (NCM), and human milk (HM) collected from the Gallician and Asturian provinces in Spain, and analyzed by thin-layer chromatography. Residues from all the compounds under investigation were found in HM, while only *p,p'*-DDT, *o,p'*-DDT, and γ-BHC were present in either PCM or NCM; *p,p'*-DDE and α-BHC were each found only in one sample of PCM, respectively. The most frequently found residue was *p,p'*-DDT in 34 samples; 20/34 were HM, 7/34 NCM, and 7/34 PCM; γ-BHC was positive in 25 samples: 18/24 HM, 6/25 PCM, and 1/25 NCM; *o,p'*-DDT was found in 15 samples; 6/15 HM, 7/15 PCM, and 2/15 NCM; *p,p'*-DDE was found in 17 samples: 16/17 HM and 1/16 PCM; α-BHC was present in 10 samples and *p,p'*-TDE in 7 samples, both in HM. The highest concentration determined was for *p,p'*-DDT (0.05 ppm), followed by *p,p'*-DDE (0.04 ppm), γ-BHC (0.03 ppm), *p,p'*-TDE (0.016 ppm), α-BHC (0.015 ppm), and *o,p'*-DDT with 0.01 ppm. None of the contamination levels exceeded the limit established by the World Health Organization and it is concluded that they are not harmful at the present time. Precautions must be taken, however, in order to avoid future contamination.

76-1359. Koch, R. (Hygiene-Institut Gera, 65 Gera, DDR). **Nachweis von polychlorierten Biphenylen (PCB) im Oberflaechenwasser.** [**Detection of polychlorinated biphenyls (PCB) in surface water.**] *Acta Hydrochim. Hydrobiol.* 5(2): 447-448; 1974. (3 references) (German)

Samples of water were taken for analysis of PCB content. The analytical method used 5-1 samples which were extracted with a mixture of *n*-hexane and diethyl ether. The extract was passed through a column of Florisil 60/100 mesh and then subjected to thin-layer chromatography using the method of Fehringer. The random samples collected from the White Elster in April-June 1973 contained PCB at n.d.-0.2 μg/l, *p,p'*-DDT at n.d.-0.1 μg/l, *p,p'*-DDE at n.d.-0.1 μg/l, and no detectable DDD (TDE) or lindane. Samples taken from an industrial wastewater line in the city of Gera contained PCB at 0.2-2.0 μg/l, whereas no traces of DDT, DDE, DDD, or lindane were detected.

76-1360. De Battistis, P.; Lucisano, A. (Fac. Med. Vet., Univ. Napoli, Naples, Italy). **Ricerca di insetticidi organoclorurati nei pate' di fegato.** [**Organochlorinated insecticides in liver pate.**] *Acta Med. Vet.* 19(1-2): 157-161; 1973. (6 references) (Italian)

Eighteen samples of liver pate were analyzed by gas chromatography to determine the presence of 7 chlorinated pesticides. All of the latter were found in all the samples although at various concentrations and at various times. Lindane was present in 12 samples from 0.003 to 0.67 ppm. Heptachlor was found in 10 samples from 0.005 to 0.88 ppm. Aldrin was found in 17 samples at 0.89 ppm and dieldrin in 16 at 0.45 ppm. Residues of *p,p'*-DDE and methoxychlor were present in 13, 10, and 11 samples respectively, at an average of 0.89, 0.31, and 0.27 ppm. These concentrations are quite high. In certain cases, they exceeded either the tolerance limits in horticultural products or the limits established by FAO/WHO.

76-1361. Pesino, L.; Lucisano, A. (Fac. Med. Vet., Univ. Napoli, Naples, Italy). **Indagini sul contenuto di pesticidi organo-clorurati nelle creme di latte.** [**Organochlorine pesticide residues in cream.**] *Acta Med. Vet.* 19(3-4): 253-259; 1973. (8 references) (Italian)

The analysis of 26 samples of pasteurized and uperized milk creams to determine the level of contamination with organochlorine pesticides shows that all samples contain chlorinated pesticides in fairly constant quantities. Lindane is frequently present, although always in quantities lower than the FAO/WHO limit (0.1 ppm). Also constantly present are aldrin, dieldrin, and *p,p'*-DDT, the first two in concentrations far greater than the FAO/WHO limits for fatty material of dairy products (0.125 ppm); *p,p'*-DDT ranges from 0.057 to 0.659 ppm (the FAO/WHO limit is 0.125 ppm). Only in a few samples were DDE and DDD found in modest quantities. The total maximum quantity of pesticides per sample is 1.149 ppm and the minimum is 0.658 ppm. Heptachlor and endrin were not found. It was also noted that the pesticide residues in creams are not affected by various preservation processes. While DDT and its derivatives are now being found in smaller concentrations, chlorocyclodienes are still being detected in dangerous quantities.

76-1362. Kraul, I.; Karlog, O. (Dep. Pharmacol. Toxicol., R. Vet. Agric. Univ., Copenhagen, Denmark). **Persistent organochlorinated compounds in human organs collected in Denmark 1972-73.** *Acta Pharmacol. Toxicol.* 38(1): 38-48; 1976. (21 references)

During the years 1972-73, samples of human abdominal fat, brain, and liver tissue were obtained from 82 Danish subjects at necropsy and the samples were analyzed for persistent organochlorinated compounds using electron capture gas chromatography. Residues of *p,p'*-DDE, *p,p'*-DDT, dieldrin, and PCB were present in almost all samples, and *p,p'*-DDD was found in most liver samples but seldom in the brain or fat tissue. There was no covariation between the content of extractable fat in the three tissue types and no correlations were found between the concentrations of either total DDT or PCB and the amount of extractable fat in the brain, liver, or fat tissue. Dieldrin was more extensively distributed to nonlipid cellular components than were DDT and PCB. No convincing

covariation between the PCB and total DDT content was seen in any organ. The values of both total DDT and PCB in the tissues examined were closely correlated with those in the other tissues. Tissue samples from males tended to contain higher residue levels than samples from females. Compared with the figures from a similar Danish study performed eight years ago, no downward trend in the content of DDT or its metabolites in the fat tissue was observed, although the dieldrin residues nearly halved in this period.

76-1363. Luquet, F. M.; Goursaud, J.; Casalis, J. (Lab. Ind. Laitiere, E.N.S.I.A., Douai, France). **La pollution des laits humains francais par les residus de pesticides organochlores. [Pollution of French human milk by organochlorine pesticide residues.]** *Aliment. Vie* 62(1): 40-69; 1974. (39 references) (French)

Human milk samples collected from lactariums all over France were analyzed for content of organochlorinated pesticides. Results are presented in 9 tables. They show that French milk is heavily polluted by DDT and its derivatives, and less so by HCB, heptachlor epoxide, aldrin, and dieldrin. None of the samples met the export norms established for animal dairy products. Qualitatively, pollution varies from one region to the other; BHC predominates south of the Loire, heptachlor epoxide and dieldrin north of the Loire, and DDT in all areas. There are no seasonal variations in pesticide concentrations. In comparison with cow's milk, human milk has BHC concentrations 5-10 times greater, DDT up to 100 times greater, heptachlor and heptachlor epoxide 4-5 times greater, and aldrin and dieldrin 5-6 times greater. DDT metabolites are present in significant quantities: 2-4 mg/kg *p,p'*-DDE and 2 mg/kg *p,p'*-DDT. There has been a significant decrease in pollution, however, within the past two years; between 1970 and 1972. BHC concentrations declined from 2.64 to 1.85 and heptachlor epoxide from 0.53 to 0.25.

76-1364. Gonzalez-Gomez, C.; Ruiz de Almodovar Rivera, J. M.; Lopez-Gonzalez, J. de D. (Radiochem. Sect., Dep. Inorg. Chem., Fac. Sci., Univ. Granada, Granada, Spain). **Volatilidad del *p,p'*-DDT en medio acuoso. 1. Influencia de la concentracion del insecticida. [Volatility of *p,p'*-DDT in an aqueous medium. 1. Influence of insecticide concentration.]** *An. Quim.* 71(6): 566-570; 1975. (11 references) (Spanish)

The volatilization of *p,p'*-DDT molecules (tagged with carbon-14) across a water-air interface was studied as a function of time. The volatilized molecules were collected in toluene traps and the sample analyzed with a liquid scintillation spectrometer. Vblatilization was found to vary directly with the initial aqueous concentration of DDT and with the surface area of the water-air interface. The DDT concentrations tested were 0.075, 0.0150, and 0.0225 mg/l. Two types of treatment cell were used, both cylindrical in shape and of similar capacity, but varying in diameter and height.

76-1365. Gonzalez-Gomez, C.; Lopez-Gonzalez, J.; Ruiz de Almodovar Rivera, J. M. (Radiochem. Sect., Dep. Inorg. Chem., Fac. Sci., Univ. Granada, Granada, Spain). **Volatilidad del *p,p'*-DDT en medio acuoso. II. Influencia de la presencia de un electrolito. [Volatility of *p,p'*-DDT in an aqueous medium. II. Influence of the presence of an electrolyte.]** *An. Quim.* 71(6): 571-573; 1975. (5 references) (Spanish)

The effect of the presence of a salt (sodium chloride) was studied on the volatility of *p,p'*-DDT, tagged with carbon-14, from an aqueous medium. The volatilized molecules were collected in a toluene trap and analyzed with a liquid scintillation spectrometer. Results indicated that the volatilization rate of the insecticide is inversely proportional to the electrolyte concentration. The test equipment was basically that of the first work in the series, the DDT concentration being kept at 0.15 mg/l throughout. The authors feel the reduction in volatility caused by the addition of a non-volatile compound is not sufficient to eliminate the contamination risk. The passage of DDT from ocean water to the atmosphere is merely a slower process than from fresh water.

76-1366. Lopez-Gonzalez, J. de D.; Banares-Munoz, M. A.; Jimenez Lopez, A. (Dep. Inorg. Chem., Fac. Sci., Univ. Granada, Granada, Spain). **Descomposicion del DDT por algunos oxidos metalicos al, Fe (III), Co (III) y Ni (III). [The decomposition of DDT by some metallic oxides: Al, Fe (III), Co (III), and Ni (III).]** *An. Quim.* 71(5): 482-487; 1975. (39 references) (Spanish)

The decomposition of DDT was investigated using simple systems of metallic oxides with trivalent cations (aluminum, iron cobalt, and nickel) due to their presence in the soil following clay breakdown and to the favorable influence of aluminum and iron oxides on the decomposition of some pesticides. Aluminum hydroxide (γ-Al(OH)$_3$; Byerite), iron hydroxide (α-Fe-OOH; goethite), cobalt hydroxide (CoOOH), and nickel hydroxide ($Ni_3O_2(OH)_4$) with particle sizes of less than 0.042 mm were thermally activated at 200°C for 24 hr (except for aluminum hydroxide, which was activated at 320°C for 120 hr). Samples of the hydroxides (0.250-5 g) were then introduced into adsorption cells and incubated at 7°C or 25°C for 100 hr with a 0.1 m*M* solution of *p,p'*-DDT in 50 ml cyclohexane. The results, evaluated by I.R. spectrophotometry, x-ray diffraction, and thin-layer chromatography, showed that the only product of degradation of DDT by the Al, Co, and Ni hydroxides was *p,p'*-DDE. The total percentage of DDE (80.9-94.5 and 93.7-100 at 7°C and 25°C, respectively, for gamma-Al_2O_3; 10.2-83.9 and 33.7-97.6 for CoO(OH), and 88.4-93.8 and 91.1-97.8 for $Ni_3O_2(OH)_4$) indicated the percentage of total catalysis. The extent of degradation was directly proportional to the amount of adsorbent used. The products of degradation by FeO(OH) were DDE and DBP and the sum of their percentages (9.0-100 at 7°C and 98.0-100 at 25°C, respectively) was taken as the total percent catalysis. The authors conclude that if DDT were to be applied in a rational manner, any excess could be easily degraded in the soil, and contamination could be avoided.

76-1367. Casalis, J.; Luquet, F. M.; Mouillet, L.; Goursaud, J. (Lab. Indust. Laitiere, Douai, France). **Les residus de pesticides organochlores dans le lait et les produits laitiers (Bilan 1973-1974). [Organochlorine pesticide residues in milk and dairy products. (Overview 1973-1974).]** *Ann. Falsif. Expert. Chim.* 68(733): 427-438; 1975. (French)

From 1969 to 1972, contamination of cow's milk and dairy products by pesticides decreased by 75%. The average national pollution of exported and non-exported products for 1972, 1973, and 1974, respectively, is as follows: HCB 0.20, 0.061, and 0.061 ppm; BHC 0.20, 0.167, and 0.175 ppm; heptachlor expoxide 0.15, 0.125, and 0.118 ppm; dieldrin 0.05, and 0.050 ppm; and DDT (plus DDE and DDD): 0.08, 0.036, and 0.035 ppm. Thus, following a rapid decrease, contamination rates seem to have stabilized for HCB, dieldrin, and DDT, while BHC pollution seems to be progressively increasing and heptachlor epoxide pollution slowly decreasing. However, pollution levels remain on the average below the tolerance limits established by most foreign countries.

76-1368. White, J. L. (Dep. Agron., Purdue Univ., West Lafeyette, IN 47907). **Determination of susceptibility of *s*-triazine herbicides to protonation and hydrolysis by mineral surfaces.** *Arch. Environ. Contam. Toxicol.* 3(4): 461-469; 1976. (6 references)

The relative ease of protonation and/or hydrolysis of *s*-triazine herbicides due to reactions on soil mineral surfaces may be measured by exposure of films of calcium-saturated montmorillonite to chloroform solutions of the *s*-triazines for appropriate time periods. *s*-Triazines susceptible to protonation are transformed into organic cations and adsorbed into the interlamellar region of the montmorillonite. Upon interlamellar adsorption of the *s*-triazine the concentration becomes sufficiently high to be detected by infrared techniques in the 1500 to 1800 c/m region. Hydrolysis of the triazines due to the "surface acidity" of the mineral surface is indicated by formation of a carbonyl band having a frequency at about 1750 c/m. The relative degree of protonation and hydrolysis has been measured for twenty-seven chloro-, bromo-, methoxy-, and methylthio-*s*-triazines. These observations aid in predicting physicochemical behavior of *s*-triazines in soils as well as formulations containing similar mineral surfaces. (Author abstract by permission)

76-1369. Yamaguchi, S.; Kaku, S.; Kuwahara, Y.; Yamada, A. (Dep. Public Health, Fac. Med., Kurume Univ., Fukuoka, Japan). **Epidemiological findings and evaluation of the amount of organochlorine pesticides in human blood plasma in Japan.** *Arch. Environ. Contam. Toxicol.* 3(4): 448-460; 1976. (15 references)

Epidemiological and experimental studies were carried out in order to evaluate the significance of the amount of organochlorine pesticides in biological specimens. The amount of β-BHC, DDT, and DDE were determined and compared in human plasma samples taken from several different socioeconomic groups. The pesticide residues thus determined reflected the differences in the amount of pesticides used for agricultural purposes in respective areas. The highest value of β-BHC was found among the people of some groups who had taken more fat-rich animal proteins than the people in other groups. It was also noteworthy that the amount of β-BHC has decreased in the females in the population who have experienced pregnancy more than one time. The animal experiment also showed the effect of pregnancy on the elimination or decomposition of the pesticides in the biological milieu. (Author abstract by permission)

76-1370. Caro, J. H.; Taylor, A. W.; Freeman, H. P. (Agric. Chem. Manage. Lab., Agric. Environ. Qual. Inst., U.S. Dep. Agric., Beltsville, MD 20705). **Comparative behavior of dieldrin and carbofuran in the field.** *Arch. Environ. Contam. Toxicol.* 3(4): 437-447; 1976. (11 references)

To measure the amounts of dieldrin and carbofuran lost to the environment, they were incorporated into soils in small (0.6-1.1 ha) watersheds in separate years. The disappearance of each was monitored by periodically measuring residues in the soil, runoff, maize plants, and overlying air (dieldrin only). Soil residues were nonuniformly distributed. Best estimate for the time for 95% disappearance of dieldrin from the soil was 12.8 years. Carbofuran disappearance conformed to a first-order reaction and gave 95% disappearance times ranging from 145 to 434 days, depending on soil pH, moisture, and temperature. Runoff losses of both pesticides were highest in rainfalls during the first month after application. Over the season, dieldrin losses ranged up to 2.3% of that applied and were concentrated in the solids. Carbofuran losses in runoff occurred largely in the water and comprised up to 1.9% of the application. More than twice as much carbofuran (and metabolites) as dieldrin was accumulated in the maize plants, mainly in the leaves. Volatilization was an important route of dieldrin loss, amounting in the first year to 4.5% of that applied. Volatility of carbofuran, which was only 1/18th that of dieldrin in a laboratory test, was not measured in the field. The data shows that use of optimum management practices can substantially reduce the environmental impact of agricultural applications of these pesticides. (Author abstract by permission)

76-1371. Knoppler, H. O.; Dorn, P. **Untersuchungen von Suesswasserfischen auf Quecksilber- und Pestizidrueckstaende. [Studies of mercury and pesticide residues in fresh water fish.]** *Arch. Lebensmittelhyg.* 27(1): 23-26; 1976. (20 references)

Mercury residues were studied in carp from 52 carp pond cultures and trout from 41 trout pond cultures, in 16 whitefish (coregones) from Bavarian lakes, and 148 river fish from the Danube, Naab, and Altmuehl Rivers. The lowest values for mercury (0.01-0.22 mg/kg) were found in carp and trout from Bavarian fish ponds, with an average of 0.063 mg/kg in carp and 0.047 mg/kg in trout. Low values

(0.003-0.200 mg/kg) were also found in muscle tissue of 16 whitefish. Concentrations of 0.01-0.57 mg/kg and 0.01-0.65 mg/kg were found in 29 fish from the Naab River and in 24 fish from the Altmuehl River, respectively. Much higher concentrations were found in fish from the Danube River: 0.08-2.47 mg/kg. Concentrations in 52 carp pond cultures and in 41 trout pond cultures were far below the tolerance levels.

76-1372. Dabrowski, J.; Czarnik, W. (Inst. Ochrony Roslin, Poznan, Poland). **Dynamika zanikania etylo-pirymifosu w niektorych warzywach. [Dynamics of pirimiphos ethyl degradation in some vegetables.]** *Biul. Inst. Ochr. Rosl.* 54: 43-56; 1972. (1 reference) (Polish)

The degradation was studied of pirimiphos ethyl, the active ingredient of the seed dressing Primicid, and of similar agents applied to beans, radishes, onions, and cabbages. The persistence of the residues in these plants was determined. Six formulations, powder, liquid, emulsion, or suspension, containing pirimiphos ethyl at 20 and 25% by weight, were employed. Samples were taken from experimental plots. The material to be analyzed was ground and a certain amount was placed in a Waring Blender. Pirimiphos ethyl and its oxidation product (P/O) were determined by gas chromatography. Hexane extracts (5 μl portions) of the substances were placed on the column of the gas chromatograph. The analysis of all vegetable samples indicated that they would not endanger consumers. Although the chemicals appeared to be safe for cabbage and bean plants, further studies of pirimiphos ethyl decomposition in cabbages and onions were recommended. Residues at harvest time (40-150 days after planting) were low, generally less than 0.1 ppm. The residues generally decreased from 1 ppm to 0.1 ppm between 20 and 40 days after planting.

76-1373. Glogowski, K.; Welter, M. (Author address not given). **Zanikanie formotionu w owocach sliw i kapuscie. [Dynamics of degradation of formothion in plum fruits and cabbage.]** *Biul. Inst. Ochr. Rosl.* 54: 387-392; 1972. (5 references) (Polish)

The degradation of formothion in plums and cabbage was studied after Anthio 25 and Anthio 33 were applied. Residues of formothion and its metabolites were analyzed using gas chromatography with flame-photometric detection. Ten days after application, the residues in cabbage amounted to 0.19 ppm and in plums, 0.16 and 0.29 ppm. The residues are expressed as the sum of dimethoate and *O*-dimethoate in the foods. The tolerance for fruits and vegetables as fixed by the Toxicological Group of the Committee for Science and Technique amounts to 0.5 ppm.

76-1374. Milhaud, G.; Bechade, A.; Pinault, L. (Chaire de Pharm. et Toxicol., Ecole Nat. Vet., 94 Alfort, France). **Relation entre la contamination du lait et la contamination de la nourriture des animaux par les insecticides organochlores. [Relation between milk contamination and the contamination of the animals food by organochlorine insecticides.]** *Bull. Acad. Vet. Fr.* 47(7): 361-366; 1974. (6 references) (French)

The organochlorine pesticide residue levels in forage and milk were measured at three small farms in 1971 and 1973 to establish relationships between the contamination of fodder and cow's milk. Forage samples examined in 1971 contained 0.01 ppm of α-BHC, 0.06 ppm of lindane, 0.013 ppm of heptachlor epoxide, and less than 0.005 ppm of β-BHC and dieldrin (in one sample each). Milk samples investigated during that period contained 0.08 ppm of α-BHC, 0.19 ppm of β-BHC, 0.08 ppm of lindane, 0.44 ppm of heptachlor epoxide, and 0.18 ppm of dieldrin. Forage investigated in 1973 showed a significantly lower degree of contamination by α-BHC and lindane and slightly lower heptachlor epoxide levels than during the previous period. The residue levels in the milk investigated in 1973 were correspondingly lower than those measured in 1971, which indicates that, since no organochlorine pesticides had been used for shed disinsection since 1967, the organochlorine pesticide residues present in forage and fodder essentially determine the contamination of milk. Therefore, great importance must be attached to the reduction of the residue levels in fodder to the acceptable limit.

76-1375. Arthur, R. D.; Cain, J. D.; Barrentine, B. F. (Mississippi Epidemiol. Studies Prog., Dep. Biochem., Mississippi State Univ., Mississippi State, MS 39762). **Atmospheric levels of pesticides in the Mississippi Delta.** *Bull. Environ. Contam. Toxicol.* 15(2): 129-134; 1976. (5 references)

A study was designed to qualitate and quantitate the atmospheric level of pesticides and their metabolites in one location in the Mid-Delta area of the Mississippi Delta. Weekly air samples were taken using a MISCO model 88 air pesticide sampler with ethylene glycol as the trapping agent during the years 1972, 1973, and 1974. A total of 156 samples were collected. Only *p,p'*-DDT and *o,p'*-DDT were found in all samples. The organophosphates, except for methyl parathion, were generally found between June and October, which corresponds to the pesticide spray season. DEF, used as a cotton defoliant, was only found in September and October. The highest levels of pesticides occurred during the summer months. DDT, methyl parathion, and toxaphene were found more often and at higher levels. These represented about 95% of all the pesticides sold in the Mississippi area prior to the ban on DDT. After this ban, methyl parathion and toxaphene made up about 88% of all the insecticides sold in that state. This study has demonstrated a distinct drop in the concentration of DDT in the atmosphere since the ban on its use. However, even though a decrease in total DDT levels was found, levels as high as 50 ng/m^3 were recorded in 1973 and 38 ng/m^3 in 1974. The DDT detected apparently came from the soil, DDT levels were observed to increase around the times

when farm work in the fields increased. A great increase in the methyl parathion levels was noted in 1973 vs. 1972, the year after the ban on DDT. However, methyl parathion usage was down 38% from 1972. Methyl parathion was less than 1 ng/m³ from November through May and then increased until it peaked in August or September. Toxaphene levels decreased from 1972 to 1973, probably due to a 55% decrease in toxaphene usage over this time. Although a 290% increase in endrin sales occurred after the use of DDT was stopped, the total amount of endrin sold was still only equal to about 2.8% of the toxaphene sales. The average 1973 air level of endrin was lower than that for 1972 in spite of a 290% increase in sales. In 1974, when the total sales of endrin were about the same as for 1973, there was a 2.5 fold increase in air levels.

76-1376. MacCuaig, R. D. (FAO/SIDA Locust Project, Desert Locust Control Org. Eastern Africa, Addis Ababa, Ethiopia). **The occurrence of insecticides in the blood of staff of a locust control organization.** *Bull. Environ. Contam. Toxicol.* 15(2): 162-170; 1976. (12 references)

Cholinesterase activity and concentrations of organochlorine insecticides were measured in blood from persons exposed to insecticides during locust control operations. While spraying, the staff was mostly exposed to BHC and/or dieldrin. However, the blood of some staff members unexpectedly displayed very high peaks for *p,p'*-DDE and *p,p'*-DDT. The presence of these residues was related to the use of DDT for an exceptionally large outbreak of the African armyworm *Spodoptera exempta* (Walker). Concentrations of other insecticides were generally insignificant. The one male who had probably been most extensively involved in spraying operations throughout the past 10 years had the highest concentrations of γ-BHC and dieldrin in his blood. A method of presenting the results of the blood tests was arranged so that even the relatively uneducated members of the staff could see by looking at a chart how their blood tests compared with those of their fellow workers. This was of particular value in that many of the staff had been handling pesticides for years and, as a result of frequent warnings concerning the hazards involved, were concerned about being adversely affected by exposure to these chemicals.

76-1377. Koss, G.; Manz, D. (Inst. Toxicol. Pharmacol., Univ. Marburg, Marburg, Germany). **Residues of hexachlorobenzene in wild mammals of Germany.** *Bull. Environ. Contam. Toxicol.* 15(2): 189-191; 1976. (4 references)

Adipose tissue from some mammals in Germany was examined for HCB content. Species examined included the fox (*Vulpes vulpes*), wild boar (*Sus scrofa*), and doe (*Capreolus capreolus*). The limit of detection was 0.01 ppm HCB in wet tissue. Residues of HCB were detected in all foxes and wild boars, but in only 4 of the 6 does. The mean levels of HCB residues were higher in the fox and wild boar than in the doe. As fox and wild boar feed on small animals, it is likely that accumulation of HCB via the food chain takes place. The doe feeds exclusively on plant materials and shows the lowest residue levels. Thus residue levels appear to be higher in predators or scavengers than in herbivores. In one of the wild boars residues of HCB as high as 3.11 ppm were found. This emphasizes the need for special care to be exercised in utilizing game animals as human food when the tolerance limit of residues including HCB are exceeded.

76-1378. Koivusaari, J.; Nuuja, I.; Palokangas, R.; Hattula, M. L. (Dep. Zool., Univ. Kuopio, Kuopio, Finland). **chlorinated hydrocarbons and total mercury in the prey of the white-tailed eagle (*Haliaeetus albicilla* L.) in the Quarken straits of the Gulf of Bothnia, Finland).** *Bull. Environ. Contam. Toxicol.* 15(2): 235-241; 1976. (25 references)

Concentrations of chlorinated hydrocarbons and mercury were examined in some of the principal prey of the eagle. An effort was made to determine which species contribute most heavily to contaminating the eagle via the food chain. Mercury, PCB, and DDE were detected in all animals studied. DDT was present in all fishes and mallards, DDD (TDE) in one goosander and one mallard. Traces of lindane were detected in two pikes, and aldrin in one pike, two mallards, and one pochard. The highest concentrations of each residue in fish were detected in the fourhorn sculpin. The great sculpins were more heavily contaminated than were the pikes and the ides. The most contaminated birds were adult mergansers, which are mainly fish-eaters. The concentrations in the juvenile mergansers were about twice as high as in other species. The only mammal analyzed was a muskrat which showed about the same concentration as the mallards and pochards. It is suggested that one of the most important reasons for the poor breeding results of the white-tailed eagle is the combined effect of the studied pollutants, originating for the most part from the fish-eating species in its prey, which pass their winters in the southern Baltic. Mercury consumed by the eagles before and during the egg-laying season in early spring might have some effect on the viability of eggs.

76-1379. Williams, I. H.; Brown, M. J.; Whitehead, P. (Res. Sta., Agric. Canada, Vancouver, British Columbia, Canada). **Persistence of carbofuran residues in some British Columbia soils.** *Bull. Environ. Contam. Toxicol.* 15(2): 242-243; 1976. (4 references)

Soils which had been treated with carbofuran one and/or two years earlier were analyzed for their carbofuran content. The data from the study did not allow firm conclusions to be drawn, but some observations were made. Carbofuran levels were remarkably high. The recommended application rate of 50 lb/acre of Furadan 10G (5 lb a.i.) should result in an initial concentration of 2.5 ppm based on a 6 in. deep acre of 2 million lb. Degradation therefore appears to have been particularly slow in these soils. Also, a build-up of carbofuran was apparent in fields

treated for 2 successive years. For poorly drained clay-muck, the residue of carbofuran found after 2 yr of treatment was 2.62 ppm; in well-drained clay muck after two years of treatment the residues was 3.88 ppm; and in poorly drained clay after 1 year of treatment the residue was 0.38 ppm.

76-1380. Pieper, G. R.; Richmond, C. E. (Pacific Southwest Forest Range Exptl. Stn., USDA, Berkeley, CA 94701). **Residues of trichlorfon and lauroyl trichlorfon in Douglas-fir, willow, grass, aspen foliage, and in creek water after aerial application.** *Bull. Environ. Contam. Toxicol.* 15(2): 250-256; 1976. (1 reference)

A study was made to determine the residue levels of trichlorfon (TCF) and lauroyl trichlorfon (TCF-12) in foliage of Douglas-fir, willow, grass, and in creek water as a function of location and time after aerial application. Both these chemicals are potential insecticides for the control of the spruce budworm. The insecticides were sprayed from a helicopter. TCF was formulated in Orchex 796 oil in a concentration of 1 lb in 5.35 pints and was applied on two plots at rates of one and two lb/acre. Due to repeated clogging of the nozzles, the spray was unevenly applied, and each plot received one lb of TCF/acre. TCF-12 was formulated in Orchex 796 oil in a concentration of one lb/acre. A fairly rapid decline of TCF residues on foliage took place during the 2 week period of study. In general, residues taken from grass and willow which grew in exposed areas showed a greater deposit. Greater exposure seemed to be correlated with a faster disappearance of the insecticide. TCF was still present in water samples after one day, but in greatly reduced amounts. TCF-12 residues on foliage declined at about the same rate as those of TCF. TCF-12 disappeared more slowly from water than did TCF, perhaps by adhesion to organic matter present in the streams. The percent recovery from fortified samples ranged from 83 to 99% in TCF and from 71 to 100% in TCF-12.

76-1381. Dhaliwal, G. S.; Lal, R. (Div. Entomol., Indian Agric. Res. Inst., New Delhi, India). **Studies on the behaviour, sorption and residues of phosphine in fumigated commodities.** *Bull. Grain Technol.* 12(1): 14-24; 1974. (13 references)

Studies were undertaken to estimate the extent of phosphine residues left in fumigated commodities in order to safeguard against the residue hazards to consumers. Phosphine gas evolved from Celphos tablets was used for fumigation. In order to study the behavior of phosphine gas in the empty bin, it was fumigated with 2 Celphos pellets (1.4 mg/l), placing them at the top, in the middle, and/or at the bottom of the bin. The behavior of phosphine was similarly studied in the bin filled with wheat grains. The bin contained about 208 kg of wheat, which filled it to a height of about 332.7 cm, leaving about 35.6 cm of empty space at the top. These studies revealed that the gas has the properties of deep penetration and uniform distribution in the grain mass within a period of 5 days. It is therefore not necessary to evenly distribute the fumigant tablets in the grain mass to ensure even distribution of the fumigant, provided the exposure period is about 5 days and the fumigation structure is completely airtight. After a period of 5 days, the average reduction in the concentration of phosphine due to sorption by wheat was 24 to 25%. Considering the losses of phosphine due to sorption and the LD_{99} values for different stages of *Trogoderma granuarium* Everts and *Cadra cautella* Walker, the recommended dosage of 2 tablets/ton can be reduced by about half in order to control these insects in wheat. Phosphine residues in fumigated wheat resulting from treatments of 2, 4, and 8 tablets/ton reached the tolerance level of 0.01 ppm in 0.77, 0.29, and 1.45 days, respectively. The corresponding time for the residues to reach the tolerance level in wheat flour was 0.69, 0.79, and 1.66 day for the above dosages. In gram, the residues resulting from these treatments reached the tolerance level in 1.68, 2.02, and 3.69 days, respectively, whereas in groundnut the times for the residues to reach tolerance levels were 1.93, 2.43, and 2.44 days.

76-1382. Terce, M.; Calvet, R. (Stn. Cent. Sci. Sol, Versailles, France). **Adsorption de l'atrazine sur des argiles bi-ioniques Ca-Al.** [**Atrazine adsorption on bi-ionic Ca-Al clays.**] *C. R. Hebd. Seance Acad. Sci. Ser. D* 279(25): 1859-1862; 1974. (6 references) (French)

Clay samples were saturated with 20, 40, 60, or 80% interfoliar aluminum cations. Thermal treatment was shown to have significant effects on atrazine uptake; adsorption reached a maximum between 250 and 300°C except for clay with 20% aluminum. Heating did not affect adsorption without aluminum treatment. Thus, the effects of thermal treatment seem to be related to the presence of the interfoliary aluminum. The proportion of aluminum cation saturating the exchange capacity also significantly affected the adsorption of atrazine. With regard to adsorption in terms of aluminum concentration, it can be said that, whatever the temperature, adsorption is not directly proportional to the quantity of aluminum. It does, however, increase with increasing aluminum quantity except at 100°C, when the quantity adsorbed reaches a maximum around 70-80 mEq of aluminum. Clay heated to 350°C does not have an adsorption inferior to that of clays treated at 250 and 300°C except for aluminum concentrations inferior to about 30 mEq.

76-1383. Doneche, B.; Seguin, G. (Inst. Oenol., Talence, France). **La degradation du "mancozebe" (produit de coordination de l'ion zinc avec l'ethylene-bis-dithiocarbamate de manganese) dans les sols de vignobles.** [**The "mancozeb" degradation (coordination product of zinc ion with manganese ethylene-bis-dithiocarbamate) in vineyard soils.**] *C. R. Hebd. Seance Acad. Sci. Ser. D* 280(19): 2265-2268; 1975. (5 references) (French)

The biological degradation of mancozeb and the

destruction of the molecule by oxidation leave a low residue in the soil after 1-2 months; the remaining active substances, however, are degraded with increasing difficulty. Mancozeb was added (60 mg/kg soil) to 6 typical vineyard soils, some samples of which were sterilized. The fungicide was determined as usual by absorption spectrophotometry. From 0 to 120 hours rapid degradation of the fungicide takes place due to oxidation and biological degradation; the process then slows down, probably due to the stabilization of the product protected by various soil colloids. Nonbiological activity then becomes very limited, while biodegradation becomes preponderant. In sterilized soils, a rise in temperature will accelerate oxidation; increased pH will also shorten persistence time of the residue. However, the soil characteristics interfere by slowing down the destruction of the molecule since, after 1500 hours, 25-48% of the active substance is still present in the sterilized soils. Biodegradation is in part due to the free enzymes present in the soil at the beginning of the experiment. After 700 hours, the soils were replenished with humus, but biological activity was renewed only in the soils richest in microorganisms; in these same soils, degradation was fastest in samples sterilized with chloroform, perhaps signifying that the latter product does not maintain prolonged inhibition of all microorganisms. The major end-products of degradation after 1,500 hours, are sulfur and ethylenediamine.

76-1384. Sotiriou, N.; Weisgerber, I.; Klein, W.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen- Umweltforsch. mbH, Munich, Germany). **Beitraege zur oekologischen Chemie CXVI. Verteilung und Umwandlung von Imugan-^{14}C in Boden und hoeheren Pflanzen unter Freilandbedingungen.** [**Contributions on ecological chemistry 116. Distribution and transformation of Imugan-^{14}C in soil and higher plants in open fields.**] *Chemosphere* 5(1): 53-60; 1976. (10 references) (German)

The distribution and degradation of ^{14}C-labeled Imugan (chloraniformethane) fungicide in soil, barley and potato plants, and in percolating water were studied under open field conditions. In one experiment, Imugan was applied on barley leaves in a quantity of 11.277 mg, and barley, potato, then barley again were grown on this field in three consecutive years. In another experiment, Imugan was applied to the soil (9.289 mg), and barley and potato were grown in the soil in the following two years. Varying quantities of metabolites were found in the soil, plants, and percolating water at the end of the first vegetation period in the first experiment. Soil extracts contained a highly polar group and two less polar groups as well as a nonextractable fraction. The percentage of Imugan within the total residue declined with increasing depth, while the ratio of the soluble and non-extractable metabolites increased. Imugan, a highly hydrophilic soluble group of metabolites, a more nonpolar fraction, and a nonextractable group were found in plants. Barley grains contained negligible radioactivity. Imugan, Highly polar substances, and traces of more apolar substances were found in percolating water. Reduction of the radioactivity in the upper soil layers and slight increase in the deeper layers were observed during the following years. The Imugan level in the soil decreased. After 3 years, 45% of the radioactivity input was still detected in the soil. The quantities removed on harvesting were 3.4% in the first year, and 0.1% each in the second and third years, and leachout accounted for 1.6%. Similar findings were obtained with soil application in the second experiment. 3,4-dichloroaniline and 3,3'4,4'-tetrachlorobenzene were identified as Imugan metabolites in the soil.

76-1385. Bazzi, B.; Santi, R.; Canale, G.; Radice, M. (Author address not given). **Applications du Cidial (phenthoate) dans la lutte contre les insectes parasites des denrees emmagasinees. Metabolisme, residus et implications de nature technologique-commerciale et hygienique-sanitaires.** [**Use of Cidial (phenthoate) in controlling pests of stored foods. Metabolism, residues, and commercial, technological, and hygienic implications.**] *Contrib. Ist. Ric. Agrar.* 11: 27-29; 1972. (French)

The possibility of utilizing detoxified Cidial against pests damaging stored grains has been verified by finding the most suitable method of application (ULV) and by assessing possible adverse effects due to residues of the active ingredient or its metabolites. Complete biological activity was obtained (on *Sitophilus granarius* adults) even at a rate of 5 ppm up to 18 months after treatment. The Istituto Nazionale della Nutrizione in Rome demonstrated that insecticidal treatments did not affect the characteristics of the products resulting from the grinding of grain and of bread made from it. The concentration of active ingredient residues, 5 months after treatment at a rate of 5 ppm, was found to be 0.4 ppm in flour, 0.1 ppm in bread, 8.3 ppm in fine bran, and 12.2 ppm in bran. Studies on the distribution of ^{32}P Cidial in caryopses and on wheat metabolism showed that Cidial tends to concentrate in the tegmentum of the grain where it undergoes an oxidation and hydrolysis process with formation of low-toxicity metabolites.

76-1386. Hilbig, D. (Fachgebiet Toxikol. und Pflanzensch., Inst. Veterinaermed. Bundesgesundheitsamtes, 1 Berlin 33, Germany). **Insektizide in Lebensmitteln.** [**Insecticides in food.**] *Dtsch. Med. Wochenschr.* 100(2): 72; 1975. (German)

The hazards are discussed of the accumulation of residues of pesticides and their metabolites in animal tissues and organs. Compliance with the Maximum Permissible Residues Act with respect to selected pesticides, and the maintenance of the necessary waiting time before slaughtering with respect to others not covered by this Act, will usually assure that the pesticide residues in animal tissues and organs at slaughtering are significantly lower than those in foods of vegetable origin. Pesticides are metabolized and eliminated from the animals' body rather rapidly. Despite their marked affinity for lipids and

fats, not even organochlorine pesticides appear to accumulate in vital organs, including the liver. The storage capacity of tissues, including the fatty tissue, is limited, and an equilibrium is reached after a certain time between uptake and elimination. In consequence, pesticide residue levels in the liver are no higher than those in other organs, muscles, and fatty tissue.

76-1387. Romo Garza, C.; Fuentes Del Valle, O.; Flores Flores, R. (Cyanamid de Mexico, Mexico City, Mexico). **Determinacion de residuos de Thimet acaricida e insecticida y Nemafos nematicidia en forma granular, applicados al suelo al trasplante, en frutos de tomate y chile. [Determination of residues of Thimet, an acaricide and insecticide, and Nemafos, a powdered nematocide and insecticide, in tomatoes and red peppers after application to transplantation soil.]** *Folia Entomol. Mex.* 25-26: 78-79; 1973. (Spanish)

Crops of Floradel tomatoes and California 300 red peppers were planted during September and November 1970 in the Culiacan Valley, Mexican state of Sinaloa. Crops were analyzed for pesticide residues at the Mexican Technical Research Institute, using gas chromatography according to a method developed by American Cyanamid. Results indicate that the first cuttings of tomatoes and red peppers contained less than 10% Thimet and less than 5% Nemafos, after these products had been applied in powdered form to the soil. Application was made to the tomato crop about one month after planting and to the pepper crop at planting time.

76-1388. Inoue, Y.; Abe, S.; Takamatsu, M.; Aoki, N.; Miki, S.; Fujiwara, K. (Dep. Environ. Health, Sch. Med., Kurume Univ., Kurume, Japan). **PCB, DDT and BHC levels in human plasma as a measurement of tissue residue.** *Fukuoka Igaku Zasshi (Fukuoka Med. J.)* 66(10): 610-616; 1975. (24 references)

Plasma PCB was measured as in relation to total body residue of PCB in cases of PCB poisoning. Paired samples of plasma and adipose tissue were obtained from 33 hospital patients at the time of operation. Additional samples were obtained from 21 other persons including blood samples, 21; s.c. fat tissue, 2; liver tissue, 1; and kidney tissue, 1. PCB concentrations in plasma and adipose tissue and the patterns on gas chromatograms were studied. The results of the study indicated that PCB, β-BHC, and p,p'-DDE in plasma reflected the residual levels of these compounds in adipose tissue. The concentrations of these compounds were higher in the emaciated than in the non-emaciated group. The PCB gas chromatograms showed varying patterns depending on the type of PCB exposure. Two cases with very high PCB concentration in the plasma were noted, 230 ppb and 92 ppb. Plasma p,p'-DDE levels in the emaciated group averaged 36 ppb, and in the non-emaciated group 22 ppb; p,p'-DDT averaged 4.7 and 3.0 ppb respectively; and β-BHC averaged 25 and 14 ppb respectively.

76-1389. Mayr, G. E. (Frankfurt/Main, Germany). **Einfluss der Muehlenbegasung mit Blausaeure, Methylbromid und Phosphorwasserstoff auf die Mehlqualitaet. [Effect of mill fumigation with hydrogen cyanide, methyl bromide, and phosphine on flour quality.]** *Getreide Mehl Brot* 28(4): 91-95; 1974. (5 references) (German)

The effects are reviewed of mill fumigation with hydrogen cyanide, methyl bromide, and phosphine on the quality of flour after fumigation. The flour treated with methyl bromide was found to retain bromine and produced an obnoxious odor during baking. Hydrogen cyanide is very soluble in water and cannot be used around food with a high moisture content, which would retain this toxic substance, making the food inedible. Flour treated with phosphine seemed to remain unchanged.

76-1390. Freyberg, G. (Laudenbach, Bergstrasse, Germany). **Rueckstandsprobleme bei der Getreidebegasung. [Residues after treatment of cereals with insecticides.]** *Getreide Mehl Brot* 28(9): 241-243; 1974. (7 references) (German)

Studies on hygienic and residue problems with phosphine, used to fumigate cereals, are reviewed. Phosphine is used in the form of aluminum phosphide, which releases high-purity phosphine in humid air. It was not possible to detect even the slightest traces of phosphine in fumigated cereals. Contamination with particulate aluminum phosphide can be avoided by adopting a technique in which the aluminum phosphide is enclosed in packets. Fumigation was found to cause no changes in organoleptic or technological properties of the flour, or in the respiratory and enzymatic activity (catalase, alcohol dehydrogenase, lipoxygenase, glutamic acid decarboxylase), thiamine, or tocopherol content of the fumigated grain. On the whole, studies have confirmed that phosphine leaves the lowest residues of all fumigants.

76-1391. Nikolova, G.; Balinova, A. (Inst. Plant Protect. Kostinbrod, Bulgaria). **Opredelyane na ostatychni kolichestva ot simazin v plodove ot yagodi, malini i kasis. [Determination of simazine residues in strawberry, raspberry, and European black currant.]** *Gradinar. Lozar. Nauka* 10(8): 51-56, 1973. (13 references) (Bulgarian)

Field studies were conducted in 1969-1971 to determine the amount of simazine residues in fruits of strawberry, raspberry, and European black currant. The plants were grown on a chernozem-smolnitsa soil with a humus content of 2.71%. Simazine was applied to strawberry at 3 kg/ha and to raspberry and black currant at 4-6 kg/ha. Samples for analysis were taken twice, at the beginning of fruit ripening and at the time of general harvest, i.e., 80 to 100 days after simazine had been applied. Analyses were done by both spectrophotometric and thin-layer chromatographic methods. They showed that simazine residues were below the tolerance level. From the sanitary toxicological point of view this herbicide is harmless, and it may be used for weed control in berries.

76-1392. Konstantinov, K. A.; Balinova, A. (Inst. Plant Protect., Kostinbrod, Bulgaria). **Prouchvane na ostatychnite kolichestva ot difenamid v domatovi plodove. [Study of diphenamid residues in tomato fruits.]** *Gradinar. Lozar. Nauka* 11(3): 101-107; 1974. (12 references) (Bulgarian)

The purpose of this two-year study was to determine the amount of diphenamid residues in fruits of tomato crops treated with the same chemical. Tomato seedlings were treated 2-3 days prior to their transplanting with Dymid (6 kg/ha) and the Bulgarian preparation diphenide (6 kg/ha) of the same base. Each cluster of ripe tomato fruits was analyzed separately by a gas-chromatographic method developed by Balinova. Test and analyses showed that there were no residues of diphenamid or its metabolites in the fruits of tomato crops treated with diphenamid.

76-1393. Domeracki, S.; Jaruzelski, M.; Zbierska, J.; Gnusowski, B. (Inst. Plant Husb., Poznan, Poland). **Dynamika zanikania pestycydow w roslinach leczniczych. II. Zanikanie pazoranu 50 WP w dziurawcu zwyczajnym (*Hypericum perforatum* L.) i w glebie. [Dynamics of pesticide disappearance in medicinal plants. Part II. Disappearance of patoran 50 WP in *Hypericum perforatum* and soil.]** *Herba Pol.* 19(4): 385-399; 1973. (27 references) (Polish)

Qualitative and quantitative methods for determining Patoran 50 WP residues were studied in an effort to establish curves for that urea herbicide's disappearance. Qualitative analysis of metobromuron, the active ingredient of Patoran, is based on thin-layer chromatography on silica gel treated with citric acid. Ehrlich's reagent has been used for visualization of spots of the main compound and its metabolites. The sensitivity of the method is 0.01 ppm. The absorption of the colored complex formed between the herbicide hydrolysis product, 4-bromoaniline, and *N*-(1-naphthyl)-ethylenediamine dichloride is measured. The disappearance curve for *Hypericum perforatum* ranged from 0.084 to 0.01 ppm. The curve for the active substance was recorded at 3 soil depths: 0-3, 6-7, and 9-10 cm. The residue in soil was 0.12 ppm at the initial time and 0.03 ppm at 122 days after spraying. Many agents are active in the migration and disappearance of the herbicide. Meteorological conditions play a decisive role as well. The compound 4-bromoaniline was the predominant degradation product, not only in solutions of the herbicide, but also in the plant extracts studied. The herbicide persists for a long time in plants and soil at a low residue level. Heavy precipitation causes an increase in the herbicide activity, which may result in a delay in the vegetative stage of the plant or even a drop in the number of plants which grow.

76-1394. Avancini, D.; Stringari, G. (Lab. Anal. Ric. Ist. Agrar. Prov., Trento, Italy). **Determinazione dei residui di pesticidi clorurati e fosforati nella frutta del Trentino-Alto Adige. [Determination of organochlorine and organophosphate pesticides in fruit from the Trentino-Alto Adige.]** *Ind. Agrar.* 12(3): 53-56; 1974. (14 references) (Italian)

Fifteen organochlorine and organophosphate pesticides were analyzed by gas chromatography on apples grown in the region Trentino-Alto Adige in 1973 and compared to 1971 residue determinations. Average concentrations (in ppm) and Italian tolerance limits are respectively 0.00056 and n.d. ("undetectable") for BHC, 0.00255 and 2.0 for lindane, 0.00262 and 0.5 for α-endosulfan, 0.00025 and 0.5 for β-endosulfan, 0.0095 and n.d. for DDE, 0.00021 and 1.0 for DDD (TDE), 0.00194 and 1.0 for o,p'-DDT, and 0.00823 and 1.0 for p,p'-DDT. Mevinphos, dimethoate, demeton, and methidathion were not detected. Diazinon, methyl parathion, and parathion were found at average concentrations of 0.00099, 0.00017, and 0.00267 for tolerance limits of 0.3, 1.0, and 0.5. The average concentration of total organochlorine pesticides decreased from 0.055 ppm in 1971 to 0.017 ppm in 1973 (a 69% decrease). DDT and its derivatives, which constitute 65% of these pesticides, also decreased in concentration by 69% (from 0.036 to 0.011 ppm). In the case of organophosphate pesticides, the residue is always either very low or nonexistent.

76-1395. Crisetig, G.; Brusco, A.; Massa, D.; Carpene, E. (Univ. Bologna, Bologna, Italy). **Residui de pesticidi e di bifenili policlorurati in alcuni formaggi Italiani. [Organochlorine residues (PCBs and pesticides) in some Italian cheeses.]** *Ind. Aliment. (Pinerolo, Italy)* 14(4): 112-117; 1975. (47 references) (Italian)

Samples of parmesan-reggiano, gorgonzola, and pecorino romano were analyzed for PCB and pesticide content. Results indicate that parmesan-reggiano has the highest concentrations. DDT and/or its metabolites, DDE, and DDD (TDE) were found in the highest concentrations (0.162-8.996 ppm, average 1.888 ppm). Only in 2 samples did the residues exceed tolerance limits. Heptachlor epoxide, dieldrin, and BHC are present at levels far lower than the maxima established by FAO/WHO. The relatively high average of DDT and its metabolites is due in large part to a single sample from an area where seed treatment with organochlorine insecticides was suspended four years ago. In gorgonzola, DDT and its metabolites (average 0.338 ppm) and heptachlor epoxide, the most frequently occurring residues, were present at concentrations below the FAO/WHO limits. Only 2 samples exceeded the dieldrin limit of 0.15 ppm. Concentrations of PCB ranged from 0.033 to 0.367 ppm. However, in all samples, polychlorinated biphenyls were found at concentrations of 0.053-0.367 ppm. In all pecorino romano samples, only BHC residues (0.078-0.165 ppm) were detected. These good results are due to highly effective land reclamation procedures performed in the producing area.

76-1396. Deshmukh, S. N.; Saramma, P. U. (Dep. Zool.-Entomol., Punjab Agric. Univ., Ludhiana, India). **Estimation of carbaryl residues in maize and cauliflower.** *Indian J. Entomol.* 33(3): 338-341; 1971. (8 references)

Carbaryl residues were determined in cob, stem, and leaves of maize at the time of harvest, and in leaves of cauliflower after the first and second sprays of the control schedule. Cauliflower was sprayed on Nov. 22 and Dec. 2 with 0.2% carbaryl at a rate of 1000 liters/ha. Samples were collected from the fields 10 days after each spraying. In experiments using maize, the crop was sprayed four times with three concentrations of carbaryl, 0.05, 0.15, and 0.25 kg/ha. Samples were collected at harvest, 78 days after the last spraying. The average residue present in cauliflower leaves 10 days after the first spraying was 2.97 ppm, just below the FDA tolerance level. At 10 days after the second spraying, the average residue was 10.02 ppm, slightly over the tolerance level. When sprayed on maize crops, carbaryl residues were detected only in the leaves. The amounts in stem and cob were below detectable levels. The average residues in the leaves due to the 3 different concentrations studied were 5.20, 5.84, and 6.95 ppm, respectively. There was a direct relation between the initial concentration and the residue, although the differences were not statistically significant. As the combined residue in leaves and stems at 78 days after the last spray was below tolerance level, the feeding of cattle on this fodder would not result in injury. In all of these experiments there was no detectable α-naphthol.

76-1397. Deshmukh, S. N.; Bhalla, J. S.; Saramma, P. U. (Pestic. Res. Lab., Dep. Zool.-Entomol., Punjab Agric. Univ., Ludhiana, India). **Studies on carbaryl, DDT and endosulfan residues on tomato fruits.** *Indian J. Entomol.* 34(1): 31-34; 1972. (10 references)

Studies were conducted to determine the residues of carbaryl, DDT, and endosulfan on marketable size tomato fruits. The insecticides were used at the following concentrations: carbaryl, 0.8 kg/ha; endosulfan, 0.4 l/ha; and DDT, 0.8 kg/ha. First applications were made at the flowering stage. Subsequently, the sprays were repeated at intervals of 14 days. Five sprays of each insecticide were given at a rate of 340 ml/min. Ripe fruits were hand picked at 0, 1, 3, 5, 7, 10, and 14 days after spraying. Residues in or on the fruits were estimated before washing and after washing the fruits while rubbing the fruit under tap water. The initial deposit of carbaryl was 5.4 ppm, below the tolerance limit of 10 ppm fixed by the FDA. The 1-day residue was 3.1 ppm. Residues could be detected up to 10-11 days. The half life was 2.61 days. The initial deposit of DDT was 2.7 ppm, which is below tolerance limit of 7 ppm. The one day residue was 1.81 ppm. The initial deposit of endosulfan was 1.41 ppm, below the tolerance limits of 2 ppm. The initial deposit degraded by 99.2% in 14-15 days. The half-life was 2.47 days. In the case of carbaryl, about 84% of the initial deposit and one day old residue were removed by washing and rubbing, whereas about 97% were removed in the case of DDT. In the case of endosulfan, only 39% of the initial deposit was removed by these processes, while 14 day old residue was removed up to 18% only. It is suggested that endosulfan may very quickly penetrate skin of the fruit.

76-1398. Gupta, D. S.; Kapoor, T. R. (Dep. Entomol., Haryana Agric. Univ., Hissar, Haryana, India). **Dissipation of malathion on cauliflower.** *Indian J. Entomol.* 34(1): 52-56; 1972. (15 references)

The dissipation of malathion on cauliflower was studied under the climatic conditions of Hissar, and the effect of washing the heads examined on the loss of malathion residue. The soil in which the cauliflower was planted was sandy loam. Malathion was used at 3 rates; 375, 600, and 800 ml active ingredient/ha. Each treatment was given 3 times in a total of 750 liters of spray/ha. Four heads of cauliflower were picked at random at intervals of 0, 1, 5, and 7 days after spraying. During this study the weather had a significant effect on the dissipation of malathion. The reduction in the residue in the spring crop was slightly more rapid than in the winter crop. The spring temperature, an average of 10° higher, had a greater degrading effect on the insecticide. The half life of malathion was 1.8 days in the spring and 2.4 days in the winter crops. When sprayed with 375 ml malathion, the initial deposits of 11.62 and 10.50 ppm in winter and spring crops, repectively, reduced to less than 8 ppm in 3 days. With the other two doses, 600 and 800 ml, the initial deposits of 26.25 and 30.75 ppm for the winter and 30.75 and 33.00 ppm for the spring crop reached this level of safety in 5 days. The maximum reduction in residues in both the crops occurred within the first 24 hr of spraying. With all three dosages of malathion, the reduction in this period varied from 24.39 to 35.42 and 36.36 to 46.43% in winter and spring crops, respectively. Corresponding figures for 7 days after spraying for both crops were 82.02 to 85.00 and 86.34 to 88.52%, respectively. The washing of the heads removed large amounts of deposits from the winter and spring crops. About 80% of the residue was removed if the heads were washed 4 hr after and about 40% if washed one day after spraying. On the fifth day after spraying washing had no effect because at that time the level of residue in the washed as well as the unwashed samples was almost equal. It is concluded that cauliflower should not be harvested within 5 days of spraying, but if it has to be picked earlier, most of the residue can be removed by washing with water.

76-1399. Gupta, D. S.; Kaushik, S. N.; Kadyan, A. S. (Dep. Entomol., Haryana Agric. Univ., Hissar, Haryana, India). **Persistence of carbaryl on grapes.** *Indian J. Entomol.41 34(1): 76-77; 1972. (4 references)*

The residue of carbaryl was studied on grapes with emphasis on the time between spraying and harvest. Each of 12 bunches of grapes (Thompson seedless) was separately dipped in 1,000, 2,000, or 3,000 ppm of carbaryl for one minute on May 28, 1970. Immediately thereafter and at fixed intervals after treatment, a few of the grapes were clipped from each bunch. Data from these studies shows that the three concentrations had initial deposits of 14.2, 25.2, and 28.3, ppm, respectively. Twenty-four hr later, the residues had declined to 11.7, 21.7, and 28.3 ppm, respectively, showing a loss of 17.7, 13.9, and 14.2%, respectively. The residues declined by half within 7 days of

treatment. The rate of dissipation was greater at lower concentrations. The lowest concentration gave a detectable residue up to 28 days after treatment, when it was 8.4%. The other two concentrations gave detectable residues up to 35 days for 2000 ppm and up to 40 days for 3000 ppm, at which time the residues were 7.1 and 5.4%, respectively. A safe limit of 10 ppm of carbaryl on grapes was reached after 2 days in 1,000 ppm treated grapes and in about 10 days in the other two treatment concentrations. Thus it is concluded that 10 days is a safe waiting period before harvesting grapes after carbaryl treatment.

76-1400. Ponti, I.; Flori, P. (Cent. Stud. Antipa, Cons. Naz. Ric., Bologna, Italy). **Residui di fungicidi benzimidazolici su mele conservate in frigorifero.** [**Benzimidazole fungicide residues on apples stored in the cold.**] *Inf. Fitopatol.* 24(1): 15-21; 1974. (9 references) (Italian)

Methylbenzimidazole carbamate (MBC, carbendazim) residues were found on apples either sprayed or dipped in benomyl or methyl thiophanate after harvesting and before cold storage. The concentrations were, for the most part, within the tolerance limits established by Italy (2.5 ppm for methyl thiophanate, 3.0 ppm for benomyl) and by Switzerland (3.0 ppm for both). The residue tends to accumulate in the skin, which contained MBC at 4-8 ppm, while in the first 2-3 cm of pulp under the skin, the residue varied from 0.5 to 0.6 ppm for methyl thiophanate and from 1.2 to 1.8 ppm for benomyl. Only minimal quantities of MBC can penetrate into the center of the fruit. The residue concentrations do not vary significantly with concentration applied. However, dipping produces significantly lower residues compared to spraying. With a 0.2% application level of pesticide, the spray method produced an 8 ppm concentration of MBC in the skin, whereas the dipping method produced a 4 ppm concentration. These residues remained on the fruit for a long time.

76-1401. Davis, A. C.; Bourke, J. B.; Kuhr, R. J. (New York State Agric. Exp. Stn., Geneva, NY 14456). **Disappearance of monitor residues from cole crops.** *J. Econ. Entomol.* 67(6): 766-768; 1974. (2 references)

The disappearance rates of Monitor (methamidophos) from several different cole crops were studied under the climatic conditions of New York. Sprays of monitor at 0.5 and 1 lb AI/acre were applied to plots of brussels sprouts, cabbage, and cauliflower on a regular basis and to broccoli once at the time of maximum heading for control of the cabbage worm complex. The deposits on cabbage heads never exceeded the tolerance level of 1 ppm with either dosage level, even on the day of treatment or after 6 treatments. There were sizable deposits of as much as 25.6 ppm on the outer leaves; these never fell below 1 ppm, even 21 days after the last application. These high deposits on the 10-12 outer leaves are not a problem, as they are left in the field as refuse. Initial deposits on broccoli were high for the two doses, but residues dissipated rapidly and were at or below the tolerance level within 1 week. The initial deposits on brussels sprouts were 1.23 and 0.67 ppm for the 2 doses and declined rapidly. Undoubtedly the leaf foliage would have substantial deposits, but 10-14 days before harvest these leaves are mechanically removed to harden the sprouts and facilitate mechanical harvesting. Monitor residues on cauliflower were so insignificant as not to surpass the range of experimental error. Under New York conditions, these four crops showed no problem in meeting the tolerance levels of 1 ppm for Monitor when treated 1 week or more prior to harvest at the 1 lb/A rate, with the exception of broccoli. During these tests rainfall was light and was not a major factor.

76-1402. Mulrennan, J. A., Jr.; Lamdin, J. M.; Bolton, H. T.; Hammond, C. L. (Navy Dis. Vector Ecol. and Control Cent., Naval Air Stn., Alameda, CA 94501). **Atmospheric levels of propoxur aboard submarines after residual spraying.** *J. Econ. Entomol.* 68(6): 755-756; 1975. (1 reference)

Air samples were taken at 2, 4, 8, 12, and 24 hr and 8 day intervals aboard a diesel submarine following the residual application of 1.1% propoxur emulsion. The propoxur became airborne but never reached atmospheric levels above 0.009 μg/liter of air, while the solvents methylene chloride and trichloroethylene never exceeded 25 ppm. The use of propoxur emulsion for cockroach control aboard submarines could be accomplished without endangering the crew or closing the boat down for an extended period of time. (Author abstract by permission)

76-1403. Ishikawa, K.; Nakamura, Y.; Kuwatsuka, S. (Life Sci. Res. Inst., Kumiai Chem. Ind., Kikugawa-cho, Ogasa-gun, Shizuoka-ken, 439, Japan). **Degradation of benthiocarb herbicide in soil.** *J. Pestic. Sci.* 1(1): 49-57; 1976. (14 references)

The degradation of benthiocarb in soil was studied, with emphasis on the degradation pathways. The properties of the soil sample used as follows were: clay mineral: kaolin; texture: sandy clay loam; clay content: 23.1%; pH: 5.83; total carbon: 1.93%; C.E.C.: 13.6 me/100 g; free iron: 1.25%; available phosphorus: 10.3 mg%; phosphate absorption coefficient: 504 mg (P_2O_2). Soil was used in two conditions, flooded and upland. For flooded conditions, 50 g soil was placed in a 300 ml bottle which was flooded with water to 1 cm deep. The sample was incubated at 30°C in the dark for 2 weeks. For upland conditions, 50 g of the soil was placed in a 100 ml flask. Water was added to adjust soil moisture to 60% of the maximum water holding capacity and the soil was incubated as above. Benthiocarb (14-C labeled) was mixed with the pre-incubated soils at a concentration of 10 ppm. Soils were then re-incubated for periods of 10, 20, 40, and 80 days. The extractable radioactivity gradually decreased, and the amount of radioactivity in the soil residue, as well as the amount released from soil, increased. The rate of

change was lower under flooded conditions than under upland conditions. The degradation products identified were the same for both flooded and upland soil conditions. The total amounts of the products were somewhat larger under upland than under flooded conditions. The amount of acetone-unextractable radioactive material increased gradually with time. At 80 days the extractable radioactivity remaining in the soil was 9% under flooded and 23% under upland conditions. The radioactive substances which were extracted with organic solvents from the soil consisted mainly of parent benthiocarb with small amounts of degradation products. About 20 radioactive spots were detected by thin layer chromatography. Desethyl benthiocarb, benthiocarb sulfoxide, 4-chlorobenzoic acid, 2-hydroxy benthiocarb, and 4-chlorobenzyl methyl sulfone were identified as relatively major products, and 4-chlorobenzyl ethyl sulfoxide and 4-chlorobenzyl alcohol as minor ones.

76-1404. Nakamura, T. (Sch. Hyg., Fac. Med., Nagasaki Univ., Nagasaki, Japan). **[Environmental pollution and its effects on organisms living in Okinawa Prefecture.]** *Kankyo Kagaku Sogo Kenkyusho Nenpo (Annu. Rep. Gen. Inst. Environ. Sci.)* 2: 24-29; 1975. (Japanese)

The present study was established to determine the levels of PCB, pesticide residues and heavy metals in soil, in the diet, and in the bodies of inhabitants of Okinawa Prefecture as a measure of environmental pollution. DDE and lead content determinations were performed on inhabitants' blood. The DDE content of human blood averaged 12.5 ± 7.7 ppb; the range was 44-5 ppb. This contrasted with the average of 11.8 ± 7.3 ppb with a range of 29 to 3 ppb in inhabitants of Nagasaki Prefecture. Compared to data published elsewhere the pesticide content of human blood in Okinawa and Nagasaki Prefectures was relatively low.

76-1405. Abdullaev, Sh.; Turakhodzhaev, M. T.; Genkina, G. L.; Shakirov, T. T. (Institute of Plant Chemistry, Acad. Sci. Uzbek SSR, USSR). **Vliyanie fungitsida "Uzgen" na kachestvo pishchevogo belka iz semyan khlopchatnika. [Influence of the fungicide "Uzgen" on the quality of food protein from cotton seeds.]** *Khim. Prirod. Soedin.* 5: 668-669; 1975. (4 references) (Russian)

Seeds of cotton plants treated with 100 and 200 kg/ha doses of the fungicide "Uzgen" (benomyl) were analyzed by thin-layer chromatography for the presence of methyl 2-benzimidazole carbamate (carbendazim), the principal metabolite of this fungicide in plants. Extraction from the oil was done with chloroform:methanol at a 2:1 ratio. Proteins were extracted from groats with a 5% aqueous solution of ammonium chloride, and then with hydrochloric acid. No traces of carbendazim were detected in cottonseed oil or in the groats, which indicates that "Uzgen" fails to migrate into cottonseeds.

76-1406. Luquet, F. M.; Goursaud, J.; Casalis, J. (Lab. Ind. Lait., Douai, France). **Pollution des laits de femme par les residus de pesticides organochlores en France. [Pollution of mothers' milk by organochlorine pesticide residues in France.]** *Lait* 55(543-544): 207-211; 1975. (16 references) (French)

The analysis of milk samples collected from 10 lactariums in different cities in France shows that the pollution level is significantly higher than that established by the World Health Organization. The milk is especially polluted by DDT and its metabolites (*p,p'*-DDE 2-4 ppm and *p,p'*-DDT 2 ppm), by BHC in all its forms (total of over 1 ppm), by HCB (0.98 ppm), and, to a lesser extent, by heptachlor epoxide (0.28 ppm) and dieldrin (0.23 ppm). Compared to cow's milk, human mothers' milk has 5-10 times more BHC, 100 times more DDT, 4-5 times more heptachlor epoxide, and 5-6 times more dieldrin. There are no seasonal variations. However, pollution varies qualitatively according to geographical location; this is perhaps due to different social settings and different feeding habits. In the Lille region, a 3-year study showed that the BHC content has decreased significantly, from 2.65 in 1970 to 1.85 in 1972.

76-1407. Dzilinski, E.; Raslawski, Z. (Inst. Vet. Hyg., Warsaw, Poland). **Szybkosc zanikania gamma HCH, metoksychloru oraz DDT i jego metabolitow w smalcu wieprozowym. [Rate of disappearance of gamma-HCH, methoxychlor, and DDT and its metabolites from lard.]** *Med. Weter.* 30(2): 97-99; 1974. (14 references) (Polish)

To determine the effect of storage in a cooler on the rate of disappearance of pesticide residues from lard, α-BHC (lindane), DDD (TDE), DDE, DDT, and DMDT (methoxychlor) were added to fresh lard (rendered by the "wet method", acidity degree 0.77, Lea number 0.80). The final concentrations were lindane 1.44 ppm, DDE 7.65 ppm, DDD 11.74 ppm, DDT 20.29 ppm, and DMDT 35.72 ppm. The samples were stored at 4-6°C, and determinations were performed (by gas chromatography) at different intervals over a 17-month period. Since it was found that there was a significant decrease in DMDT level after 3 months, determinations of this compound were also performed at 2 week intervals for 3 months. Statistically significant decreases were observed in the level of DMDT after 6 weeks, of DDT after 7 months, and of DDE and DDD after 10 months, but no decrease was observed for lindane after 17 months. After 17 months the level of DDE decreased to 84.57% of the initial value, the level of DDD to 86.88%, the level of DDT to 70.23%, and the level of DMDT to 50%. It can be assumed that storage in a freezer (-15°C) would prevent the breakdown of these compounds even further.

76-1408. Dzilinski, E.; Ortwein, L. (Dep. Vet. Hygiene, Warsaw, Poland). **Poziom pestycydow polichlorowych w tluszczu zajaca-szaraka (*Lepus europaeus* Pallas) z terenu Wielkopolski. [Level of polychlorinated pesticides in adipose tissue of the European hare (*Lepus Europeaus* Pallas) from the Wielkopolska region.]** *Med. Weter.* 30(8): 494-496; 1974. (20 references) (Polish)

Using gas chromatography, samples of adipose tissue from 120 European hares from the Wielkopolska region were examined for residues of γ-HCH (lindane) and DDT and its metabolites. All samples were divided according to age (old or young) and sex of animals. Fat from old animals contained more DDT residues than that from young animals (young females 0.34, young males 0.42, old females 1.23, old males 1.06 ppm). γ-HCH was detected in only 22 animals (in amounts < 0.005 ppm in 17, at < 1 ppm in four, and > 1 ppm in only one animal). The level of *p,p'*-DDT and its metabolites was below 1 ppm in 75.6% and between 1 and 2 ppm in 24.4% of the animals killed during the hunting season (Oct. 15, 1970-Jan. 10, 1971 and Dec. 1971). Methoxychlor and dieldrin were not detected. It is concluded that the low-level residues of polychlorinated pesticides in the fat of hares represent no danger to the consumer.

76-1409. Tate, K. G.; Van der Maspel, G. J.; McGrath, H. J. W. (Hort. Res. Cent., Min. Agric. Fish., P. B., Levin, New Zealand). **Fensulfothion residues in carrots.** *N. Z. J. Exp. Agric.* 3(1): 99-101; 1975. (6 references)

Fensulfothion residues were determined in carrots grown in treated soil at 3 North Island locations during 1970. Fensulfothion was applied as 5% granules, either broadcast on 0.46 m wide ridges or banded below the seed, which was drilled in rows 0.35 m apart. The following rates of fensulfothion/ha gave acceptable residue levels at normal harvest dates: Levin, up to 3.4 kg broadcast incorporated or 1.1 kg banded below seed rows: Pukekohe, up to 2.9 kg broadcast incorporated or 0.6 kg banded below seed rows: Ohakune, up to 3.4 kg broadcast incorporated. At each site, at least one sample had residues above the tolerance levels, but these were sufficiently close to the 0.1 mg/kg tolerance and infrequent enough not to rule the concentration unsafe. It appears from this study that up to 3.4 kg/ha fensulfothion can be safely broadcast at sowing time, but if below-seed banding is intended the rate should probably not exceed 1.1 kg/ha at a low spacing of 0.35 m. If row spacing is reduced below 0.35 m, the rate/ha can be proportionately increased without a decrease in safety.

76-1410. Andersen, D. R. (Nebraska Univ., Lincoln, NB). **Water quality models for urban and suburban areas.** *Natl. Tech. Inform. Serv.* PB-238 622, 1974, 114 p.

Samples were taken of urban storm runoff for analysis to study various pollution parameters. The data obtained from these samples was used to develop a model technique for simulating the quantity and quality of runoff observed. A hydrograph simulation model was used to generate flow hydrographs comparable to the observed data. Modeling techniques similar to those used in the EPA Storm Water Management Model were used for modeling COD, BOD, and solids. Also, data was obtained relative to nitrogen, phosphorus, pesticides, and bacteria concentrations in the runoff. The data from this study generally confirms the "flush effect" of pollutants at the start of the runoff period. The data also showed that urban storm water may contain significant amounts of pollutants.

76-1411. Miyabe, M.; Tsuchiya, H. (Nagoya Munic. Inst. Public Health, Nagoya, Aichi, Japan). [**Current status of organochlorine insecticide residues in animal foods and human milk in Nagoya City.**] *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 22(10 Suppl.): 223; 1975. (Japanese)

Organochlorine pesticide residues were determined between December 1969 and May 1975 in commercially prepared animal products and in human milk in mothers at Nagoya Municipal Hospital. Residues of total BHC in commercial milk and beef declined markedly between 1969 and 1975. However, total BHC and total DDT in human milk were still high, suggesting slow excretion from adipose tissue in which they have accumulated. It is presumed that the biological half life of total BHC in human milk at present would be higher than the 0.52 yr which had been obtained when human milk was more highly contaminated by total-BHC. Furthermore, even when it was assumed that the BHC excreted from a cow's body is dissolved in cow's milk and excreted as a solution, no deviation was found. It was suggested that the pollution of human milk by organochlorine pesticide residues will continue for a fairly long time.

76-1412. Kikawa, H.; Kawamura, T. (Yokohama Munic. Inst. Public Health, Yokohama, Kanagawa, Japan). [**Pesticide residue inspection results.**] *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 22(10 Suppl.): 224; 1975. (Japanese)

Results of investigations of pesticide residues in agricultural crops and of investigations on the translocation of pesticide residues from soil to crops were reported. Pesticide residues in crops were determined using commercial agricultural products of known origin. Translocation was studied by applying the usual amounts of BHC, DDT, aldrin, dieldrin, and endrin, followed by vegetable planting, harvesting, and determination of pesticide residues. Of the organochlorine pesticide residues, BHC, DDT, and related compounds were detected at nearly 100 ppb in 1968. After the organochlorine ban, the residues declined rapidly in many cases to less than trace levels. BHC residual amounts were found in decreasing order of beta, alpha, gamma, and delta-BHC. Of the DDT derivatives, *p,p'*-DDT and DDE were detected in equal amounts, and other derivatives showed less than trace quantities. Parathion could scarely be detected. Organophosphorus pesticides detected at more than 10 ppb included diazinon on cabbage, ethylthiometon on Chinese cabbage, and fenitrothion on Japanese pear. The translocation rate of BHC into vegetables was 0.2-7.6%; higher amounts was found for the beta-isomer. The translocation rate of DDT generally was lower in cucumber and dieldrin was usually higher. The residual amount in soil within 3 years after application declined to 55, 20, 10, and 1% of the amount applied.

76-1413. Kveseth, N. J.; Bjerk, J. E. (Inst. Farmakol. Toksikol., Norges Veterinaerhogsk., Oslo, Norway). **Rester av organiske klorininsekticider og PCB i noen norske kosumvarer.** [**Residues of organochlorine insecticides and PCBs in some Norwegian foods.**] *Nord. Veterinaer-Med.* 27(7-8): 384-388; 1975. (18 references) (Norwegian)

Oats, barley, wheat, rye, mutton, pork, beef, chicken (broiler), bouillon, margarine, and cod roe were analyzed by gas-liquid chromatography for organochlorine pesticides and PCBs. Residues of PCBs, lindane, and DDT and its metabolites DDE and DDD were found in only a few samples. The residue levels were usually below 0.005 ppm (wet weight basis) in meat, bouillon, and cod roe, and in the 0-0.001 ppm range in grain and margarine. Total DDT was in the range of 0.005-0.015 ppm in about 50% of the grain samples, and between 0.001-0.015 ppm lindane was found in 85% of the samples. Of all meat samples, only chickens contained 0.01-0.1 ppm of total DDT in about 50% of the samples. Chicken bouillon contained traces of DDT, and 50% of these samples contained 0.006-0.1 ppm of PCBs. PCBs were found in all margarine samples in a range of 0.016-0.10 ppm. DDE was found in a range of 0.005-0.015 ppm in about 50% of these samples. Some 33% of all cod roe samples contained 0.006-0.015 ppm of DDE.

76-1414. Lanciotti, E.; Grasso, C.; Borselli, L. (Ist. Ig., Univ. Firenze, Florence, Italy). **Sulla presenza di residui di insetticidi clorurati in campioni commerciali, di latte in polvere per neonati.** [**Organochlorine pesticide residues in commercial samples of powdered milk for newborns.**] *Nuovi Ann. Ig. Microbiol.* 26(1): 27-33; 1975. (9 references) (Italian)

Organochlorine pesticide residues were determined in 18 powdered milk samples (15 samples of powdered cow's milk and 3 samples of simulated human milk formula, basically composed of vegetables, protein, lipid, and vitamin elements). These types of milk, from various commercial sources, were used to feed young infants and also elderly individuals. Determination, in a portion of fat extracted with a 1/1 mixture of petroleum ether and ethyl alcohol, was effected by chromatography. Most of the specimens (14) contained pesticides at various levels, from 0.324 to 0.8579 ppm. DDE and *p,p'*-DDT were the most prevalent: 0.0666 and 0.0239 for the powdered milk and 0.0455 and 0.0699 for the formula. Heptachlor, lindane, and aldrin were also found in lesser quantities. No correlation was found between the fat content of the samples and their pesticide content. Since high temperatures are used in preparing the powdered milks, the insecticide content is probably initially somewhat reduced. This underlines the significance of the results presented here, considering that these products are the basic if not exclusive food of newborns and often the elderly as well.

76-1415. Leoni, V.; Puccetti, G.; D'Alessandro De Luca, E. (Ist. Igiene "G. Sanarelli", Univ. Roma, Rome, Italy). **Indagini sul contenuto di pesticidi cloro-organici in diete totale in Italia. Parte IV: l'esaclorobenzene negli alimenti non preparati.** [**Content of organochlorine pesticides in total diet in Italy. IV. Hexachlorobenzene in uncooked foods.**] *Nuovi Ann. Ig. Microbiol.* 26(1): 34-43; 1975. (8 references) (Italian)

In 1971-1972, the presence of hexachlorobenzene was determined in non-cooked foods, along with the daily intake of HCB for the average individual in Rome and its outskirts, Milan, and Naples. Results indicate an intake of 4.23 μg HCB /person/day, or 0.07 μg/kg body weight. Since the limit established by FAO/WHO is 0.6 μg/day/kg body weight, the HCB dose found is 12% of the acceptable concentration. With regard to milk contamination, the FAO/WHO Committee has established a practical limit of 0.3 ppm in the fat, or in other words, about 10 ppb for a milk with an average fat content of 3.5%. The average HCB concentration in 63 samples was found to be 4.1 ppm, which is about 40% of the established limit.

76-1416. Leoni, V.; D'Alessandro De Luca, E.; Puccetti, G. (Ist. Igiene "G. Sanarelli", Univ. Roma, Rome, Italy). **Indagini sul contenuto di pesticidi cloro-organici in diete totali in Italia. Parte V: l'esaclorobenzene negli alimenti preparati e pronti al consumo. Aggiornamento dei dati sugli altri pesticidi cloro-organici.** [**Organochlorine pesticides in total diet in Italy. V. Hexachlorobenzene in ready to eat prepared food. Updating of information on other organochlorine pesticides.**] *Nuovi Ann. Ig. Microbiol.* 26(1): 44-56; 1975. (6 references) (Italian)

Cooked food samples were taken from a mess of the Italian Navy to determine HCB content in the total diet for a week. Results indicate that 4.11 μg is ingested per person, per day; this corresponds to 11.4% of the acceptable daily intake proposed by FAO/WHO in 1973. The quantities of individual organochlorine pesticides ingested daily in food are well below the respective ADIs. Average intakes of pesticides in prepared foods and in unprepared foods compared to the ADI are, respectively, (in μg): 5.35, 4.70, and 750 for lindane; 16.72, 14.59 and unspecified for total BHC; 2.76, 2.65, and 6 for aldrin and dieldrin; 8.23, 8.31, and 30 for heptachlor and heptachlor epoxide; 0.72, 2.37, and 60 for chlordane; and 35.38, 55.69, and 300 for total DDT.

See also **76-1437** **76-1447** **76-1555** **76-1564** **76-1581**

76-1417. Cordoba Palacio, D. (Dep. Pharmacol. Toxicol., Fac. Med., Univ. Antioquia, Medellin, Colombia). **Intoxicaciones en Pediatria. [Poisoning in pediatrics.]** *Antioq. Med.* 24(6): 543-551; 1974. (12 references) (Spanish)

Difficulties in the diagnosis and management of poisoning in children are presented. Obstructive factors include: erroneous first-aid administered by parents or relatives, delay in bringing the patient to the physician, indiscriminate drug consumption, self-medication and use of home-remedies which hinder the identification of the poisonous substance, the dispensing of drugs in polyethylene or paper containers attractive to the child, the absence of proper labels indicating the active compound and the antidote, the lack of statistical information available to medical personnel, and the scarcity of physicians and paramedics. The rapid onset of the symptoms and their similarity to infectious processes must be considered. Poisonings by pesticides and rodenticides may present with severe convulsions or unconsciousness and should not be confused with epilepsy or diabetic coma. In the city of Medellin (Colombia, S.A.), 73% of accidental poisonings were attributed to carelessness of the parents; 30% of the poisons were found in the bedroom and 15% in the kitchen. Out of 448 cases observed between 1966 and 1969, the main causes of poisoning were organophosphorus compounds (85), hydrocarbons (68), foods (55), promazines (30), and organochlorine compounds (24). The nature of poisonous pesticides or rodenticides (including sodium fluoroacetate) varied with the type of flora, fauna, or season of the year. The most common forms of treatment were gastric lavage, induction of vomiting, oxygen therapy, diuresis, and antidotes. Education of the general public with respect to the dangers of poisoning is advised.

76-1418. Koeing, C. C.; Livingston, R. J.; Cripe, C. R. (Dep. Biol. Sci., Florida State Univ., Tallahassee, FL 32206). **Blue crab mortality: interaction of temperature and DDT residues.** *Arch. Environ. Contam. Toxicol.* 4(1): 119-128; 1976. (21 references)

Serial observations of DDT-contaminated and uncontaminated salt marshes in the northern Gulf of Mexico were made in November and December, 1973. Blue crab (*Callinectes sapidus*) mortalities observed in the DDT-contaminated marsh during this period were correlated with reduced daily temperature minima. Gas chromatographic analysis of hepatopancreas and swimmeret muscle tissue of dead and dying crabs revealed total DDT residue concentrations as high as 39.0 ppm and 1.43 ppm, respectively. It is suggested that the DDT body burdens and reduced temperatures interact to produce acutely toxic effects. Several physiological and behavioral mechanisms are proposed. (Author abstract by permission)

76-1419. Hayes, W. J., Jr. (Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Mortality in 1969 from pesticides, including aerosols.** *Arch. Environ. Health* 31(2): 61-72; 1976. (15 references)

Among the 87 deaths in the United States in 1969 for which a causal relationship to pesticides could not be excluded, there were 62 valid accidents, 20 intentionally inflicted deaths, and five deaths incorrectly attributed to pesticides. The reduction in the number of such deaths compared to the decade and a half prior to 1962 probably involves a trend. As in the past, a disproportionate fraction of the victims were children, boys and men, and nonwhites. Findings in four cases (three in 1969) were consistent with the conclusion that intensive inhalation of an aerosol can sensitilize the heart to fatal arrhythmia, even though there is no intentional misuse of the aerosol and no attempt to seek a thrill. Medical examiners should be alert to the possibility of such deaths associated with both pesticide and non-pesticide aerosols. (Author abstract by permission)

76-1420. Gulic, F.; Hojs, M.; Rogl, F. (Dep. Int. Med. Pathol. Morphol., Gen. Hosp., Maribor, Yugoslavia). **Slucaj otravanja parakvatom. [A case of paraquat poisoning.]** *Arh. Hig. Rada Toksikol.* 26(3): 227-232; 1975. (6 references) (Serbo-Croatian)

An 18-yr-old girl ingested about 40 ml of 20% paraquat in a suicide attempt. She was hospitalized in the intensive care unit 5 days after ingestion. Corrosions of the mucous membranes of tongue and pharynx were noted on admission. Slight renal lesions with pathological findings were noted during renal function tests. Arterial blood gas analyses showed diffusion disturbance in the lungs. A shortage of breath was observed 10 days later. This worsened until death on the 17th day after ingestion. Treatment in this case consisted of forced diuresis, corticosteroids, antibiotics, cardiotonics, and oxygen. The most pronounced histological changes occurred in the lungs, consisting of diffuse interstitial fibrosis and proliferation of bronchiolar epithelium. Changes were also found in the liver, spleen, kidneys, brain, and heart.

76-1421. Vandekar, M. (Vector Biol. Control, WHO, Geneva, Switzerland). **Aspects of the assessment of pesticide exposure and hazards to man.** *Arh. Hig. Rada Toksikol.* 26(3): 233-241; 1975. (18 references)

Mammalian toxicity studies are essential in assessing the hazard of any new insecticide or newly developed method of application to control arthropod-borne diseases, but the ultimate assessment of the safety in the intended usage depends upon studies of human exposure. Generally, the most useful information is obtained by studying people occupationally exposed, e.g., spraymen. The WHO Program for the Evaluation and Testing of New Insecticides involves seven testing stages, three performed in the laboratory and four performed in the field. A number of organophosphorus and carbamate insecticides have been tested in field trials. Such trials demonstrated that malathion and fenitrothion can be safely used provided certain precautions are observed, though fenthion is unsuitable for routine residual indoor spraying.

3-Isopropylphenyl *N*-methylcarbamate produced symptoms of systemic poisoning in humans exposed during field trials. Carbaryl proved to be safe for both spraymen and villagers; propoxur can be used safely provided work with the pesticide is stopped when minor symptoms of toxicity first appear. No differences in morbidity and mortality have been identified in men with tissue levels of DDT considerably in excess of those found in the general population. The need exists to extend this type of toxicological assessment to users of agricultural pesticides, particularly those using these pesticides under tropical conditions where recommended means of protection are seldom feasible.

76-1422. Liska, D.; Tildyova, K. (Dep. Hyg., Nat. Inst. Hyg., Bratislava, Czechoslovakia). **Studium zmien aktivity niektorych enzymov v krvi pilotov a mechanikov, exponovanych organofosforovym pesticidom.** [**Study of the changes of activity of some enzymes in the blood of pilots and engineers exposed to organophosphorus pesticides.**] *Cesk. Hyg.* 19(6/7): 289-295; 1974. (15 references) (Czech)

Changes in the activities of cholinesterase, SGOT and SGPT, alkaline phosphatase, and LDH and its isoenzymes were studied in the blood of pilots and engineers occupationally exposed to organophosphorus pesticides. Such exposure caused inhibition of cholinesterase in red blood cells and plasma and increased the activity of GPT and the isoenzymes LDH_1-LDH_1, particularly LDH_5. The results of this study did not confirm previous findings on the effects of organophosphorus pesticides on GOT and alkaline phosphatase. These changes in enzyme activities were reached within 4 to 11 days of exposure to organophosphorus compounds. The average time to reach maximum change was 7.5 days, with a maximum single exposure time of 3 hr and a flight average of 30 takeoffs/day in 1970. In general the employees were exposed for a period of 3 to 19 years, with 7.6 yr being the average. The results of this study indicate the importance of the problems and the urgency of solving the public health questions concerning aviochemical application of pesticides.

76-1423. Teitelman, U.; Adler, M.; Levy, L.; Dikstein, S. (Rambam Hosp., Haifa, Israel). **Treatment of massive poisoning by the organophosphate pesticide methidathion.** *Clin. Toxicol.* 8(3): 277-282; 1975. (4 references)

A case of poisoning is presented involving methidathion, the active ingredient in the insecticide Supracid 40. A protocol for the treatment of organophosphorus poisoning is given. A 25 yr old farmer was discovered unconscious in the fields. Two hours prior to this time he had swallowed a number of mouthfuls of the insecticide Supracid 40. On hospitalization, treatment with atropine, toxogonin, and cortisol hemisuccinate 1.5 g i.v./day was commenced. At the time of admission he received 500 mg toxogonin and 6 mg atropine sulfate i.v. Five hours after he was found, intubation and gastric lavage were performed. He remained critical over the next seven days with high fever, in deep coma, with transient, changeable neurologic findings. Atropine was given during the first 3 days in isotonic saline in increasing doses until a plateau of 175 mg/day was reached. Toxogonin was given again on the second and third day, in 4 doses of 250 mg each. Jaundice which appeared on the 4th day necessitated interruption of the toxogonin treatment. Intravenous hyperalimentation was started on the third day with supplementation of sodium and potassium through a catheter placed in the superior vena cava. To counteract low prothrombin values and possible hepatic damage, 40 mg Mephyton was given daily from the 4th day. After 4 days the prothrombin value returned to normal and the jaundice regressed. A volume respirator was used to maintain respiration. Cephalothin (6 mg/kg) was given prophylactically. A definite but gradual improvement was noted after the first week and artificial respiration was stopped on the 15th day. The daily dose of atropine was 12 mg/day. With the exception of cholinesterase activity, which remained low, the initial abnormal laboratory findings were at this time normal. Until the 18th day he continued to complain of severe generalized muscle weakness. Follow-up examinations at 2, 5, and 10 months showed no abnormalities and no delayed neurotoxicity was found.

76-1424. Schaap, A. L.; Sunshine, I. (Cleveland Health Sci. Lib., Allen Mem. Library, Cleveland, OH). **Computer retrieval of articles on the therapy of poisonings.** *Clin. Toxicol.* 8(3): 301-310; 1975.

Joint efforts have been made by the Cleveland Poison Information Center and the Cleveland Health Science Library to develop a workable system for scanning current journal literature for relevant articles on the therapy of poisoning and to develop a suitable system for reorganizing present reprint files for these units in the Poison Information Center of that city. The basic data base consists of the standard tests in the field including *Clinical Toxicology of Commercial Products* by Gleason et al., *Handbook of Poisoning* by Dreisbach, *The Pharmacological Basis of Therapeutics* by Goodman and Gilman, along with various publications from drug and cosmetic manufacturers, National Clearinghouse for Poison Control Centers file cards, and monthly supplements to Clinical Toxicology of Commercial Products. Current Contents-Life Sciences is scanned regularly. Under the area of computer retrieval systems, MEDLINE is already available. Serious thought has been given to including TOXLINE as well.

76-1425. Rieger, H.; Okonek, S. (Neuro-Psychiatr. Med. Klin. Johannes-Gutenberg-Univ., Mainz, Germany). **L'E.E.G. dans les intoxications par les inhibiteurs de le cholinesterase (insecticides organo-phosphores).** [**EEG in poisonings with cholinesterase inhibitors (organophosphorus insecticides).**] *Electroencephalogr. Neurophysiol. Clin.* 5(1): 98-101; 1975. (13 references) (French)

Electroencephalograms of 17 patients with acute poisoning by organophosphorus pesticides were analyzed. The EEG of the initial acute comatose phase is characterized by desynchronization of rhythmic components with alpha and beta frequency. These rhythms, not varying with stimulation, are different from physiological alpha waves. Slow waves are absent. This EEG can persist for up to 3 days, and improvement is indicated by the appearance of long episodes of delta waves in the frontotemporal region upon stimulation. During the following phase, the EEG is more synchronized, and delta waves of large amplitude dominate. The third phase, corresponding to cholinesterase activities rebounding up to and exceeding the normal by 20-30%, is characterized by the reappearance of a labile alpha rhythm containing slower waves.

76-1426. Hills, J. P. (Messenger, Lynch, Hills and Miller, Attorneys and Counselors at Law, Beltsville, MD 20705). **Legal decisions and opinions in pollution cases.** *Environ. Sci. Technol.* 10(3): 234-238; 1976.

U.S. courts are waiving traditional burdens of proof, and are giving increasing weight to expert opinions and/or lowering their standard of necessary proof when dealing with the "frontier of scientific knowledge," and questions of public health. Cases involving asbestos in water, lead in gasoline, vinyl chloride exposure in workman, and EPA's ban of the pesticide aldrin/dieldrin illustrate the logic in this trend. In the latter case, the Court observed that aldrin-dieldrin had been shown to be carcinogenic in mice and probably in rats, although there was no data indicating its carcinogenicity in humans. These chemicals persist in the environment and more than 96% of U.S. citizens have about 0.27 ppb in their fatty tissue. The defendants argued that there was no proof of a human health hazard because one could not extrapolate data from mice to humans. Stating that assuming a substantial showing of danger, the Administrator should not be required to make impossible proofs, the Court found that EPA's suspension was supported by substantial evidence and upheld the administrative decision.

76-1427. Gervais, P.; Diamant-Gerger, O.; Bascol-Liversac, J.; Guillam, C.; Guyon, F. (Fernand-Widal Hosp., Paris, France). **Problemes medico-legaux et medico-sociaux de l'intoxication aigue par les herbicides du groupe du paraquat.** [**Forensic and medico-social problems of acute intoxication caused by herbicides of the paraquat group.**] *Arch. Mal. Prof. Med. Trav. Secur. Soc.* 36(1-2): 19-36; 1975. (12 references) (French)

From anatomopathological and toxicological viewpoints, there are two aspects of intoxication by herbicides of the paraquat group. In the case of early death due to ingestion of a massive dose, the lesions are hardly characteristic: digestive erosion, hemorrhages, visceral (especially pulmonary) congestion, acute tubular nephritis, and cytolytic hepatitis. In such cases, the toxicological determinations in the body fluids and the viscera show very large amounts of the toxic substance. In the case of delayed death, in less immediately deleterious forms, the lesions become almost pathognomonic in their association with recent pulmonary fibrosis, caustic lesions of the digestive tract, and resolving tubular nephritis. After prolonged reanimation efforts and numerous extracorporeal dialyses, it may be impossible to determine the toxic substance dose. In case of minor forms, sequelae are possible, associating an obstructive syndrome, atrophic pneumopathy, emphysema, and interstitial fibrosis with disturbances in pulmonary mechanics and diffusion. Herbicides of the paraquat group are already subject to fairly strict utilization regulations; they should remain under epidemiological surveillance to verify the absence of important disturbances in workers utilizing these products and to reduce the number of ingestion accidents. More stringent legislation might become necessary if the social consequences of the use of these products remain significant.

76-1428. Fournier, E. (Fac. Med. Lariboisiere, St. Louis, Univ. Paris, Paris, France). **Toxicite humaine des pesticides.** [**Toxicity of pesticides to humans. Pathological effects of acute oral and chronic exposures to pesticides in man.**] *Bull. Soc. Zool. Fr.* 99(1): 39-48; 1974. (French)

Organochlorine and organophosphate pesticides have significantly different acute toxicities (mainly seen after intentional ingestion). The most serious, often deadly, intoxications in man are due to organophosphates and paraquat. The former produce intense digestive disturbances; muscular asthenia, bronchial hypersecretion, neuromuscular and respiratory difficulties, muscular fasciculation, coma, and exceptionally, pulmonary edema, which can be treated with contrathion (pralidoxime). Paraquat induces dysphagia, gastrointestinal irritation, diffuse visceral alterations with renal insufficiency, progressive respiratory insufficiency by fibrosis, and hepatic and myocardial effects leading to death. There is no effective therapy. There are no specific antidotes except for organophosphates. Organochlorines are significantly less dangerous. Absorbed massively, they essentially produce nervous disturbances in children, and frequently reversible convulsions and coma. Subacute intoxication (repeated ingestion for several days) occurs with organophosphates, which produce inhibition of serum and erythrocyte cholinesterases. Inhibition lasts several weeks in the absence of treatment. Sub-chronic and chronic intoxications are much harder to define since, in the course of a lifetime, they affect only a small portion of the exposed population. Intoxication usually requires the interaction with extraneous factors or products. Clinical symptoms are frequently of an irritative nature (dermatitis, conjunctivitis). Allergic manifestations are characterized by atypical clinical signs: asthma, eczema, visceral alterations, involvement of immune systems, and of hypersensitivity. Prevention must be rigorous.

76-1429. Ozawa, H.; Usui, N.; Ishikawa, S.; Nakajima, S. (Sch. Ophthalmol., Fac. Med., Kitasato Univ., Sagamihara, Kanagawa, Japan). [**Studies on EGG follow-up survey of intoxicated patients.**] *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 70(3): 278-281; 1976. (8 references) (Japanese)

Results of follow-up electrogravitogram studies with several changes in visual input are described. It was found that the body balancing function of patients chronically intoxicated by organophosphorus pesticides and other substances was remarkably inferior to that of normal persons. The fluctuation of the component of right and left oscillation was especially conspicuous. When eyeball movement was measured following loading tests in chronic intoxication patients, about 20-80% reduction of fluctuation in the center of gravity was found as compared to normal activity in the patients. The clinical usefulness of electrogravitograms for such tasks as determining the existence of inhibition or excitation was discussed.

76-1430. Kovalenko, L. I.; Bulkina, V. A.; Panteleev, R. I. (Author address not given). **Tri sluchaya otravleniya gliftorom.** [**Three cases of gliftor poisoning.**] *Gig. Tr. Prof. Zabol.* (12): 53-54; 1975. (Russian)

Acute poisoning with gliftor, a pesticide composed of 30% glycerol chlorofluorohydrin and 70% glycerol difluorohydrin, was studied in three tractor drivers who, mistaking it for alcohol, ingested 30 ml each of this liquid. Motor disorders comprising complex chloreiform hyperkinesis (Kulenkampff-Tarnow syndrome) due to lesions in the cortical and subcortical structures of the corpus striatum and of the limbicoreticular portion of the brain were the principal poisoning symptoms. There were no symptoms of fluorine poisoning. One patient, who presented the first symptoms 48 hr after ingestion of the poison, died in respiratory collapse 6 days later. Leukocytosis (up to 20% rod neutrophils), hyperglycemia, a serum potassium level of 2.7 mEq/liter, proteinuria, pyuria, and hematuria were observed. Histopathological examination revealed acute circulatory disturbances in the internal organs, parenchymatous dystrophy, and dystrophic changes in the central nervous system.

76-1431. Roberts, D. V. (Dep. Physiol., Univ. Liverpool, Liverpool, England). **EMG voltage and motor nerve conduction velocity in organophosphorus pesticide factory workers.** *Int. Arch. Arbeitsmed.* 36(4): 267-274; 1976. (16 references)

Electromyography (EMG) was used to study peripheral neuromuscular function in male factory workers engaged in the manufacture and formulation of organophosphorus pesticides and in nonexposed workers. The mean EMG voltage in 102 organophosphorus workers was 9.97 mV, compared with 12.73 mV in 75 nonexposed workers; this difference was significant. In some workers, the EMG voltages increased after a 3 wk vacation; among the pesticide workers, the voltages tended to be higher in those with a low probability of pesticide contact as compared with those with a high probability of contact. Workers with EMG voltages lower than 10 mV had average motor nerve conduction velocities which were about 10% below normal, whereas those with voltages equal to or greater than 10 mV had normal conduction velocities. Conduction velocities among pesticide workers also averaged 10% less than those of nonexposed workers. Thus, people working with organophosphorus pesticides tend to show disturbances of nerve and muscle function.

76-1432. Lisella, F. S.; Johnson, W.; Lewis, C. (Cent. Dis. Control, Public Health Serv., Dep. Health, Educ., Welfare, Atlanta, GA). **Health aspects of organophosphate insecticide usage.** *J. Environ. Health* 38(2): 119-122; 1975. (14 references)

Since many of the techniques and procedures of DDT application cannot be used with parathion due to its toxicity, there will be an increase in organophosphate-associated illnesses unless behavioral patterns and application procedures are changed. The problem will be greatest on the farm, in the home, and in the general environment. Although the mortality rates from pesticides in the U.S. have not increased since 1946, the percentage of deaths attributable to organic phosphates, and particularly parathion, has increased. The majority of pesticide poisonings occur among children aged 4 yr or less and 89.19% of the poisonings in 1970 were due to an accidental or inadvertent ingestion of the pesticide. In addition, it has become increasingly evident that proper safety procedures are required to prevent human illness resulting from entry into organophosphorus insecticide-treated fields.

76-1433. Bescol-Liversac, J.; Paquelin, A.; Guillam, C. (Lab. Cent. Hop. Fernand-Widal, Paris, France). **Etude ultrastructurale d'une biopsie renale chez un patient intoxique par le paraquat.** [**Ultrastructural study of a renal biopsy in a patient intoxicated by paraquat.**] *J. Eur. Toxicol.* 8(4): 236-246; 1975. (9 references) (French)

Human intoxication by paraquat develops in three phases: digestive (erosion of the buccal, pharyngeal, and esophageal mucosa), renal (acute tubulopathy), and respiratory (rapid and progressive development of pulmonary sclerosis). The case history of a 60-yr-old man illustrates a moderate renal intoxication due to a paraquat-diquat mixture, studied on the basis of clinical data and electron microscopy of biospied tissue. The renal lesions are those of an almost pure tubular nephritis. These lesions are found mainly on the epithelium of the proximal and distal convoluted tubules. The extent of the lesions and the deteriorative process of the cellular constituents will vary from one structure to the other and even from cell to cell. While capillaries supplying the tubules can also show moderate lesions, glomerular and interstitial deterioration is rare. Paraquat can turn into a stable free radical and thus interfere in oxidoreductive processes and, subsequently, damage the enzymatic chains notably involved in cellular

respiration. It is not known whether the same mechanism is involved in the deterioration of the renal epithelium or if a more general activity of paraquat, which is a quaternary ammonium compound, is involved. According to a recent theory, paraquat deprives the cell of sulfur-containing amino acids; the lack of glutathione would then be responsible for pulmonary cellular deterioration. It is not known whether this also applies to the renal epithelium. If the pattern of opaque deposition on the membranes could be verified, it would be possible to speak of an immune phenomenon, undoubtedly a complication of the intoxication.

76-1434. Ballantyne, B. (Minist. Defense, Sect. Toxicol. Pathol., Med. Div., Chem. Defense Establishment, Porton Down, Wiltshire, England). **Safety evaluation of pesticides.** *J. Forens. Sci. Soc.* 15(2): 99-105; 1975. (9 references)

The nonmandatory scheme presently regulating the sale, supply, and usage of pesticides in the United Kingdom is the Pesticides Safety Precaution Scheme. In accordance with the Scheme, a notifier is required to supply sufficient detailed information on a pesticide to enable its safety to be assessed. The product may not be introduced until appropriate precautionary measures have been agreed upon and its usage may be restricted or prohibited if undesirable properties become evident after clearance. The main points for which the notifier is required to submit information are the product's specification, mammalian toxicity, residues, and effects on wildlife and environment. There are four levels of product clearance: trials, limited, provisional commercial, and commercial clearance. A notification dealt with by Committee procedure is considered first by the Scientific Subcommittee, and they by the Advisory Committee and the Departments concerned. If accepted by the latter recommendations regarding protection of the user, consumers of treated goods, livestock, and wildlife are sent to the manufacturer before being published as official documents. The Pesticides Safety Precaution Scheme also plays a part in determining the most appropriate labeling for a pesticide. Legislation relating to pesticides in the United Kingdom includes the Agricultural Act of 1952, the Pharmacy and Poisons Act, and the Farm and Garden Chemicals Act of 1967. Although there appears to be no widespread abuse of pesticides in the U.K., the nonagricultural uses of pesticides should also be subject to close supervision.

76-1435. Cortez Pimental, J. (Dep. Pathol., Carlos I Sanatorium and Inst. Pathol. Anat. Med. Sch., Lisbon, Portugal). **Angiossarcoma do figado e inalacao de cobre num sulfatador de vinhas. [Angiosarcoma of the liver and inhalation of copper in a worker treating grapevines with sulfur.]** *J. Med.* 88(1667): 541-544; 1975. (17 references) (Portuguese)

The case is reported of a 54-yr-old male vineyard worker hospitalized with general intestinal disturbances, loss of weight, and abdominal pains of 6 mo duration. His anamnesis revealed the presence of frequent cough and mucopurulent expectoration of 32 yr duration, and the fact that he was employed at the spraying of grapevines with a mixture of copper sulfate and slake lime (Bordeaux Bath) from the age of 18 to 53. The patient died suddenly 12 days after admission. The post mortem examination revealed a large nodular liver tumor; the right lung presented metastatic nodules and both lungs showed micronodules and fibrous bundles of dark blue color characteristic of the so called *vine sulfurizer lung*. The histopathological examination of the tumor prompted the diagnosis of hepatic angiosarcoma (malignant hemangiosarcoma). The Kupffer cells contained deposits of copper and showed proliferation and migration in the sinusoids of the liver, outside the limits of the tumor. The possibility of classifying this tumor as an "occupational cancer" is suggested by the author.

76-1436. Spynu, E. I.; Molozhanova, E. G.; Stefanskiy, K. S. (All-Union Sci. Res. Inst., Toxicol. Pesticides, Polymers, and Plastics, Kiev, USSR). **Gigienicheskoe normirovanie pestitsidov v pochve. [Health standards for pesticides in soils.]** *Khim. Sel'sk. Khoz.* 13(10): 69-71; 1975. (11 references) (Russian)

Maximum permissible concentrations of DDT, BHC, lindane, polychloropinene (strobane), polychlorocamphene (toxaphene), and carbaryl were determined in the soil. The maximum permissible concentration was defined as the level in soil which will result in no excesses beyond the maximum allowable levels established for water, air, and plants into which the pesticide can migrate. At this level, the pesticides also will not adversely affect the general hygienic and biological properties of the soil. The maximum permissible concentration was determined to be 1 mg/kg for BHC, DDT, and lindane, 0.5 mg/kg for polychloropinene and polychlorocamphene, and 0.05 mg/kg for carbaryl. To comply with these standards, polychloropinene and polychlorocamphene should be used in doses of 1.5-2 kg/ha, and the application rate of carbaryl should be limited to 1.6 kg/ha.

76-1437. Yamida, Y. (Sch. Public Health, Kurume Med. Coll., Kurume, Fukuoka, Japan). **[Effects of organochlorine pesticides on the health of mothers and newborn children.]** *Kurume Igakkai Zasshi (Kurume Med. J.)* 38(12): 1468; 1975. (Japanese)

Organochlorine pesticide content in 130 paired specimens of human plasma (from blood of mothers and umbilical cords) was determined by ECD-gas chromatography. All determinations showed greater content in mothers than in umbilical cords; larger amounts of organochlorines, except β-BHC, in umbilical cords of primiparas than in those of multipara; and a tendency for the levels of organochlorine pesticides in mothers' blood and umbilical cord blood to be higher in newborns with substandard growth rates. Experimental data indicates decreased pregnancy rates, lowered body weight, and conspicuous newborn body weight decreases when rats

were administered β-BHC p.o. before pregnancy. According to β-BHC determinations in animal blood, transplacental translocation and translocation to newborns via mothers' milk occurred. Data suggests that effects of β-BHC may be anticipated in newborns from older primiparas.

76-1438. Holmstedt, B. (Natl. Med. Counc., Sweden). **En dialog om lindan med arbetarskyddsstyrelsen. [A dialog on lindane and industrial hygiene.]** *Laekartidningen* 72(49): 4816-4818; 1975. (5 references) (Swedish)

A toxicologist's critical comments are presented on a widely publicized and released official report from the Swedish Industrial Hygiene Administration, in which organophosphorus pesticides in general, and dichlorvos in particular, as well as lindane are claimed to cause chromosomal aberrations and leukemia. This official report, prepared by a chemist untrained in toxicology and medicine, represents a gross and unnecessarily alarming generalization of literature data, according to which the role of lindane and dichlorvos in leukemia can not be ruled out. This incident clearly indicates the need for a responsible, competent approach to toxicological problems, and for stemming irresponsible vulgarizations in the mass media.

76-1439. Eben-Moussi, E.; Djoumbi-Sango, E.; Foumbi, J. (Serv. Therapeut. Urgences Med. Graves, Hop. Cent. Yaounde, Africa). **Intoxications aigues en milieu urbain Africian. I. Notre experience des intoxications medicamenteuses et domestiques. [Acute intoxications in urban Africa. I. Experiences with poisoning by drugs and household products.]** *Med. Afr. Noire* 22(8-9): 565-570; 1975. (5 references) (French)

Pesticides make up 5% (44/264) of intoxications from industrial, agricultural, or domestic sources. This group is more common in Africa than incidents of drug intoxication. In this study, no intoxications by organophosphates were recorded, but insecticides based on chloralose and organochlorine insecticides were found frequently as causes of acute intoxication in both children and adults. Clement rat poison (based on glucochloralose) intoxication has frequently led to early onset of coma, although not deep coma, with exaggerated tendon reflexes, salivary and bronchial hypersecretion, and especially convulsions; all symptoms quickly regressed after treatment with atropine, diazepam, centrophenoxine, and cardiorespiratory resuscitation. Gamophene (based on lindane) seems to be used frequently for suicide by agricultural workers in rural areas. In 2 cases out of 4, subacute pulmonary edema was noted when the victim came in for treatment.

76-1440. Garcia Rico, A. M.; Garces Bruses, J.; Mas Marfany, J.; Nolla Pandes, R. (Hosp. Munic. Nuestra Senora dell Mar , Barcelona, Spain). **Intoxicacion aguda colectiva por bromuro de metilo. [Collective acute poisoning by methyl bromide.]** *Med. Clin. (Barcelona)* 63(6): 291-296; 1974. (14 references) (Spanish)

The case is reported of a 42 year old seaman admitted to the emergency ward in a comatose state. The patient was one of a crew of 3 men who lost consciousness immediately after entering an airtight deep-tank, located in the hold of a ship and containing a cargo of fertilizer treated with methyl bromide for insecticidal purposes. The men were rapidly rescued (total time of exposure not stated) and taken to a first-aid station where 2 of them were dead on arrival. The survivor was treated with oxygen, Luminal, Largactyl, and Phenergan (doses not stated), and was hospitalized 9 hr later. During a 23 day stay in the intensive care emergency ward he was in serious condition with convulsions, great agitation, amnesia, apraxia, and inability to eat or stand. He was treated with diazepam (maximum 60 mg/24 hr), Largactyl, Phenergan, vitamin B, and ampicillin (for pulmonary complications). After 3 mo in the internal medicine division, he was released in markedly improved condition. The 10 men from the rescue team also suffered slightly from exposure to methyl bromide but recovered within 24 hr. The banning of methyl bromide or provision of protective gas masks and safety suits is recommended.

76-1441. Bulteau, V. (R.P.A.H. Med. Cent., Newtown, N.S.W., Australia). **Nose and throat: occupational hazards.** *Med. J. Aust.* 63(1-2): 27-28; 1976.

This paper reviews recent reports on the effects of occupational factors on the incidence of nose and throat disorders. In a study of workers occupationally exposed to pesticides, no otorhinolaryngological effects of clinical significance were found in men with moderate exposure compared to a control group. This finding was obtained in spite of the increased storage of the pesticides in their bodies.

76-1442. Conde, J. (Author address not given). **Prevencao do cancro: suas bases, teoricas e praticas. [Prevention of cancer: theoretical and practical basis.]** *Arq. Patol.* 46(2-3): 209-219; 1974. (Portuguese)

An extensive review of carcinogenic factors is presented and programs and means for the prevention of cancer are discussed. Among the factors causing cancer in the general population are exogenous contamination of food with carcinogens including insecticides, herbicides, fertilizers, antibiotics, etc. Among the occupational causes of cancer, mention is made of the inclusion of arsenic in insecticides. Hueper, an internationally recognized authority on carcinogenesis, states a conviction that the consumption of wine from grapes treated with certain pesticides can cause certain types of cancer. Experimental tumors have been induced with aldrin, amitrole, aramite, DDT, heptachlor, Metepa, and thiourea. The allegation that high concentrations of DDT and dieldrin are found in people that died of cancer has not been completely con-

firmed, due to the impossibility of establishing a cause-effect relationship. These pesticides have been found to induce experimental hepatoma in rats.

76-1443. Musser, F. L., III. (Author address not given). **Medical-legal aspects of environmental disease.** *Med. Trial Tech. Q.* 22(1): 89-103; 1975. (14 references)

The short- and long-term diseases which may occur as a result of toxic metal pollution, radiation, air pollutants, and pesticides are discussed, as are the legal effects and liabilities. It is no longer questionable that both man and wildlife encounter ill effects resulting from the use of certain pesticides. Major problems in this area center on pesticides entering the cyclic processes of natural food chains and on toxicity in farm and migrant workers. While in certain cases it can be medically proven that an individual had died as the result of a single or repeated exposure to a certain pesticide, the legal cause and its attendant liability may not be as easily identified. Where a polluter violates the federal law by using a prohibited pesticide or by using an approved one to excess, legal liability may be found for the diseases or deaths of persons directly linked to or caused by such pesticide use. In the absence of any prohibited usage, it is difficult for a person suffering from a physiological or neurological disease brought about by long-term exposure to pesticides to prove a case against any particular polluter or group of polluters. Furthermore, the more subtle, indirect, and long-range effects of exposure to small amounts of pesticides on man and wildlife are not known. Medical and legal causation may be clear, but the attendant liability is not.

76-1444. Okonek, S.; Hollmann, H.; Boelcke, G. (Zent. Entgift. Giftinform. II. Med. Klin. Poliklin. Univ., Mainz, Germany). **Alkylphosphat-Intoxikation: Giftelimination durch Haemodialyse oder Blutaustausch-transfusion? [Alkylphosphate intoxication: toxin elimination through hemodialysis or blood exchange transfusion?]** *Med. Welt* 27(8): 351-356; 1976. (46 references) (German)

The possibility of eliminating nitrostigmine (parathion), dimethoate, and demeton-*S*-methylsulfoxide from blood through hemodialysis or blood exchange transfusion was studied in vitro in human blood. The dialyzability of nitrostigmine was studied in vivo in male Wistar rats. At a blood circulation rate of 100 ml/min, in vitro, the dialysance values obtained for demeton-*S*-methylsulfoxide, dimethoate, and nitrostigmine are 52.98 ml/min, 59.07 ml/min, and 0.00 ml/min, which suggests the high efficiency of dialysis in the treatment of poisoned patients. Only 0.06% of the i.v. injected nitrostigmine could be eliminated from Wistar rats by dialysis.

76-1445. Karimov, V. A. (Uzbek Sci. Res. Inst. Hyg. and Occup. Dis., USSR). **Rol' vitaminov C i B_1 v terapii khronicheskikh intoksikatsiy pestitsidami. [Role of vitamins C and B_1 in therapy of chronic poisonings with pesticides.]** *Med. Zh. Uzb.* 2: 6-12; 1974. (Russian)

The effect of chronic poisoning with organochlorine and organophosphorus pesticides on the urinary and blood levels of vitamins C and B_1 was studied in 121 farm workers and in rabbits poisoned with rogor (dimethoate 7.5 mg/kg), lindane (6.2 mg/kg), or mixtures of the two. The therapeutic effectiveness of these vitamins on chronic poisoning with rogor and lindane was investigated in rabbits. Significant reductions of vitamin C levels in blood and urine and considerable increases in the vitamin B_1 levels were observed in chronically poisoned farmworkers and rabbits. Rabbits poisoned with daily 3.8 mg/kg doses of rogor or 3.1 mg/kg doses of lindane for 3 mo were given 30 mg/kg doses of vitamin C and 2 mg/kg doses of vitamin B_1 subcutaneously each day for 14 days. Both vitamins, but especially vitamin C, intensified the detoxifying action of the liver. While vitamin C normalized the cholinesterase activity, vitamin B_1 caused further inhibition, and it retarded the normalization of the vitamin C level. Vitamin C reduced the vitamin B_1 level, while treatment with vitamin B_1 caused a further increase in the otherwise high vitamin B_1 level. The findings indicate the therapeutic effectiveness of vitamin C, and suggest that vitamin B_1 should not be given in chronic poisonings with pesticides.

76-1446. Tsubura, Y.; Shimomura, H.; Watanabe, T.; Tsuji, H.; Takahashi, A.; Fukuyama, T. (Second Sch. Pathol., Med. Univ., Nara, Japan). **Toxicity of 1,3-bis(carbamoylthio)-2(*N*,*N*-dimethylamino) propane hydrochloride (cartap) to mice after p.o. administration for 3 months.** *Nara Igaku Zasshi (J. Nara Med. Assoc.)* 26(4,5): 368-378; 1975. (7 references)

Six-week-old male and female ICR/JCL mice were fed diets containing 100, 300, or 900 ppm cartap over a 3 mo period. The pesticide had no effect on mortality, behavior, body weight gain, average food intake, or cumulative food intake. Food efficiency was somewhat lower in the animals of the 900 ppm group and the females of the 100 ppm group. Although the blood cell counts remained within the normal range in all experimental animals, the counts were lower in proportion to the cartap dose in the experimental females as compared with control females. With the exception of splenomegaly in one female, there were no gross abnormalities in the experimental animals. The renal weights were slightly reduced in the 900 ppm group, and the liver:body weight ratio was slightly higher in the males of the 100 ppm group. Inflammatory lesions were found in the liver, pancreas, heart, and kidneys of all mice which died during the experimental period. It is concluded that cartap, when given orally, is detoxified rapidly in mice and that there is little possibility of accumulation.

76-1447. Reagan, M. T. (Bioeng. Res. Dev. Lab., Fort Detrick, Frederick, MD 21701). **Preliminary investigation of sensitized photolysis as a method for the destruction of herbicides derived from 2,4-dichlorophenoxyacetic acid.** *Natl. Tech. Inform. Serv.*, AD-A006 507, 1974, 34 p. (19 references)

The use of photosensitized decomposition in aqueous solution as a possible means of disposing of excess stocks of 2,4-D was investigated. Under the conditions of the study photodecomposition of 2,4-D was more than three times faster with uranyl ion than with riboflavin. Photolysis of 2,4-D can be effected with ferric ion as a catalyst, but only under heterogeneous conditions. In methanol solution the 2,4-D octyl ester was quickly saponified by adding a small excess of aqueous potassium hydroxide. The appropriate dilution of the reaction mixture and the addition of riboflavin sensitizer permitted photodecomposition of the 2,4-D which was thus produced. Decomposition of 2,4-D octyl ester in isopropyl alcohol with triphenylamine, with riboflavin, with Michler's ketone, and with propiophenone was not successful.

76-1448. Vind, H. P.; Mathews, C. W. (Civil Eng. Lab., Naval Construction Battalion Cent., Port Hueneme, CA 93043). **Biodeterioration of Navy insecticides in the ocean.** *Natl. Tech. Inform. Serv.*, AD-A007 568, 1975, 9 p. (1 reference)

Studies have been made of the biodeterioration of insecticides in ocean water. Based on these studies, it was theorized that water-insoluble chlorinated insecticides are transported in sea water primarily by being absorbed in the fatty cell membranes of microorganisms suspended in the water. Thus, insecticides somewhat less fat-soluble than DDT will not enter the ocean food chain as readily as DDT will. Therefore, they would not be as hazardous as DDT and yet may be just as toxic and persistent. This theory allows the suggestion that insecticides in sewage can be removed with the microbial cells in a primary or secondary treating plant.

76-1449. Arthur D. Little, Inc. (Cambridge, MA). **Alternatives to the management of hazardous wastes at national disposal sites.** *Natl. Tech. Inform. Serv.*, PB-225 164/3, 1973, 93 p.

This study defines and evaluates technical, economic, risk, and legal factors associated with the various alternatives for managing hazardous waste materials. Considered were on-site processing, off-site processing, and on-site pre-treatment with off-site treatment and disposal. The differences among these alternative approaches were considered in the light of economics, immediate risks to human safety, and the eventual hazards to the environment. The legal and institutional issues which would have an effect on the national treatment system were included. The major conclusion of the report was that, on economic grounds alone, the majority of producers of industrial hazardous wastes would prefer off-site treatment facilities. For the pesticide industry, waste problems arise in the form of tank rinsings from applicators, liquid formulations, and unused or deteriorated formulations. Chlorinated hydrocarbon wastes occur as liquids, slurries, solids, and aqueous solutions. Incineration at temperatures of 2500-2800°F can destroy the most resistant of these chemicals. Solid and liquid phases would be separated before incineration. The liquid phase may be mixed with fuel oil and fed to a rotary kiln through an atomizing nozzle while the solid phase is charged directly into the kiln.

76-1450. Matsushita, T.; Arimatsu, Y.; Misumi, J.; Tomio, T.; Nomura, S. (Dep. Publ. Health, Kumamoto Univ. Medical School, Kumamoto, Japan). **Skin disorders caused by herbicides sodium chlorate and sodium 2,2-dichloropropionate.** *Kumamoto Med. J.* 28(4): 164-169; 1975. (12 references)

Two spraymen involved in the application of sodium chlorate and sodium 2,2-dichloropropionate (dalapon) to forest areas were studied, as were 76 male workers involved in similar applications and 16 control subjects. The first sprayman suffered from inflammatory pigment-hyposynergia, and the second suffered from contact dermatitis. Patch testing in the first case revealed positive reactions to 10% Desolate AZ at 72 hr and 10% Chlorate FE at 24 hr after application; a positive reaction to 0.1% sodium 2,2-dichloropropionate was observed at 24 hr in the second case. Among the 76 male workers, subjective symptoms such as copious sweating, anorexia, skin lesions, nausea, and throat pain were reported, but physiological testing revealed no significant objective abnormalities. Six workers suffered from contact dermatitis and a similar disorder was suspected in 21 others; the cutaneous symptoms were generally slight. Patch testing revealed no significant differences between the spraymen and controls. Precautions should be observed to avoid the occurrence of contact dermatitis among workers using 2,2-dichloropropionate.

76-1451. Kurosawa, K.; Abe, E.; Sasaki, K.; Shimazaki, K.; Yamagisawa, T.; Matsushima, S. (Dep. Pestic. Intox., Jpn. Inst. Rural Med., Usuda, Nagano, Japan). [**Studies on the toxicity of oryzemate. Its acute and chronic (2 yr) toxicity to rat and mouse.**] *Nippon Noson Igaku Kenkyusho Nenpo (Annu. Rep. Jpn. Inst. Rural Med.)* 3: 251-284; 1974. (Japanese)

The p.o. LD50 of oryzemate (fungicide against rice blast), 3-allyloxy-1,2-benzoisothiazole-1, 1-dioxide) was determined in male (1647 mg/kg) and female (1810 mg/kg) rats, and in male (1812 mg/kg) and female (1859 mg/kg) mice. The i.p. LD50 was 806 mg/kg (male rat), 840 mg/kg (female rat), 578 mg/kg (male mouse), and 630 mg/kg (female mouse). Rats and mice were fed a diet containing 750, 150, 30, and 6 ppm oryzemate for 2 yr. Animals were sacrificed after 6, 12, and 24 (20 for mice) mo of feeding to determine chronic effects of oryzemate. No marked change was found in their general condition. Inhibition of body weight gain was observed in male mice of the 750 ppm group; this was not definite in other groups. Intake of feed and water was greater in mice of the 750 ppm group. No significant change was found in RBC, WBC, hemoglobin, hematocrit, or differential leukocyte count. No consistent change was found in total protein, cholesterol,

SGPT, blood sugar, urea nitrogen, or albumin/globulin ratios. Pathohistologically, fatty degeneration, vacuolar degeneration, and cystic dilation of urinary tubular epithelium were recognized as the major changes. Occurrence of hepatoadenoma was suspected to be due to oryzemate.

76-1452. Tanaka, T. (Inst. Environ. Toxicol., Kodaira, Tokyo, Japan). [**Safety of agricultural chemicals (pesticides for agriculture and forestry).**] *Noyaku (Pestic. Agric. For.)* 23(1): 50-53; 1976. (Japanese)

Two standards are now in active use for evaluating the persistence and toxicity of pesticides presently registered for agricultural and forestry uses in Japan. These are the amended Agricultural Chemicals Act and the process for establishment of standards in evaluating pesticide residue safety. When a pesticide is to be registered nationally, the applicant should present the results of persistence (in crops and soils) experiments performed at more than one official experiment station, with analytical data obtained by more than one laboratory. One may be done at an unofficial laboratory. Toxicological data must also be presented. The toxicological experiments which should be performed consist of acute p.o., inhalation or s.c., and i.p. toxicity tests on more than two species of mammals. Also required are chronic (life-long) toxicity tests in rats and mice, with data on effects in more than two generations, on mammalian reproductive functions, and on the fate of the pesticide (absorption, metabolism, and excretion), as well as mutation data (using microorganisms in vitro and in vivo).

76-1453. Goldfrank, L.; Kirstein, R. (Morrisania City Hosp., New York, NY). **The aromatic vegetarian.** *Hosp. Physician* 12(3): 10-13; 1976. (8 references)

A previously healthy 23-yr-old man was hospitalized with generalized weakness, crampy abdominal pain, diarrhea, and clumsiness of both legs. The pulse was 125, the blood pressure was 75/50, the abdomen was diffusely tender, the lower extermities showed a trace of edema and were painful to touch, ankle and patellar reflexes were absent, there was distal muscle wasting in both lower extremities, vibratory and point discrimination were impaired in all extremities, and the breath had an odor of garlic. The urine showed distinct proteinuria with numerous red and white blood cells, and an abdominal film showed nonspecific ileus with diffuse intra-abdominal calcifications. The patient had been working in his father's fields and orchards, sprayed with arsenic-containing insecticides, herbicides, and rodenticides. He was a confirmed vegetarian and consumed large quantities of basic health food supplements. The diagnosis was chronic arsenic absorption. Emergency measures of emesis, lavage, and catharsis are indicated in such cases and basic therapy with dimercaprol should be instituted immediately.

76-1454. Trakhtenberg, I. M.; Kutsenok, B. I.; Dorshun, M. N.; Gil'man, Ts. I. (Inst. Ind. Hyg. Occup. Dis., Natl. Inst. Protect. Metals against Corrosion, Moscow, USSR). **Gigienicheskaya otsenka sorbtsionnykh svoistv i pronitsaemosti khimicheski stoikikh materialov (pokrytii) k param rtuti i ee organikheskim soedineniyam.** [**Hygienic evaluation of sorptive properties and permeability of chemically resistant materials (coatings) to mercury vapors and its organic compounds.**] *Gig. Tr. Prof. Zabol.* 11: 8-12; 1975. (6 references) (Russian)

Various experiments were conduted to determine the suitability of mercury-impervious materials and compositions used to prevent residue accumulation in building structures exposed to the action of organomercuric compounds (OMC). The results showed that not all mercury-impervious materials are effective. Polymeric coatings, with epoxide-furane as the base, were recommended for use on compact, sandy-cement, or concrete foundations, and on floors in rooms where OMC or preparations containing OMC are stored, used, or manufactured. A five-layer varnish of perchlorvinyl and epoxide coatings laid on plastered surfaces was recommended to protect vertical surfaces of building structures in industrial plants. Residues accumulated in building structures may be released into the air, presenting a threat to workers.

76-1455. Scheufler, H. (Halle (Saale), DDR). **Vietnamkrieg und Oekologie.** [**The Viet Nam war and ecology.**] *Biol. Rundsch.* 12(3): 211-212; 1974. (6 references) (German)

The effects of the herbicides 2,4,5-T and 2,4-D on the forests of Viet Nam were profound. It is predicted that it will take the Mangrove forests 20 years to recover. The rubber plantations had to be replanted to a large extent. Other trees suffered growth and yield losses. Some cases of cattle death from eating sprayed fodder were reported. Observers have reported that wild mammals, birds, and reptiles are rarely seen in sprayed areas. The manufacturers' advice that sprayed meadows should not be used for grazing for two years seems superfluous under these conditions, as treated areas no longer offer suitable conditions for animal rearing.

76-1456. Merte, H. J.; Roggenkaemper, P. (Augenklin. Tech. Univ., Munich, Germany). **Augenschaedigungen im Hopfenanbau.** [**Ocular injuries in the hops culture.**] *Klin. Monatsbl. Augenheilkd.* 164: 125-129; 1974. (German)

The typical ocular injuries sustained in hops culture can be cited as damage by wires, pesticides burns, and irritations and lesions from foreign bodies. Hops are generally sprayed with pesticides up to eight times prior to harvest. However, the ocular burns which were common in the past have become far less of a problem with the availability of improved spray equipment. Injuries due to inhalation of pesticides remain an occupational hazard. A

great variety of pesticides are used in hops cultivation, producing a range of symptoms including allergic contact eczema of the eyelids. Adhering pesticide residues impede healing of corneal erosions caused by the sharp-edged hop leaves or the fine hairs or thorns on the stems and undersides of the leaves.

See also **76-1351** **76-1376** **76-1504**

76-1457. Hettwer, H. (Inst. Aerobiol, Fraunhofer-Gesellschaft, Duesseldorf, Germany). **Ueber Veraenderungen an der Ultrastruktur der Rattenniere nach Phosphorsaeureestervergiftung. [Changes in the ultrastructure of rat kidney after intoxication with organophosphates.]** *Acta Histochem.* 52(2): 165-210; 1975. (34 references) (German)

The kidneys of female Sprague Dawley rats were examined by electron-microscopic and histochemical methods after intoxication with *O*-pinacolyl methylphosphono fluoridate (soman, 0.180 mg/kg i.p.). Similar investigations were made with the control animals, with animals after 24 hours of hypoxia, and with animals starved for 36 hours. In the phosphate-treated animals the epithelial cells of the basal labyrinth showed a striking extension. The restricted sodium resorption led to the swelling of the intercompartmental space. Further changes in the epithelial cells of the two nephron segments after treatment with the organophosphate were swelling of the mitochondria, reduction of the cristae to the point of the total destruction of these mitochondria, formation of myelin figures, and swelling of ER and Golgi complex.

76-1458. Robertson, B.; Grossmann, G.; Ivemark, B. (Dep. Pediatr. Pathol., Karolinska Inst., Stockholm, Sweden). **The alveolar lining layer in experimental paraquat poisoning.** *Acta Pathol. Microbiol. Scand.* 84A: 40-46; 1976. (15 references)

Ultrastructural abnormalities of the alveolar lining layer were studied in an effort to understand early inactivation of pulmonary surfactant in experimental paraquat poisoning. Adult female Sprague-Dawley rats were sacrificed 2-24 hr after s.c. injections of 35 mg/kg paraquat. Animals treated with paraquat displayed some swelling and disintegration of mitochondria in granular pneumocytes. Also, there was slight cytoplasmic swelling in membranous pneumocytes and in alveolar capillary endothelium. However, there was no disruption of the outer membranes of the degenerating alveolar epithelial cells and no desquamation of epithelial cells was noted. The alveolar lining layer had the same heterogeneous appearance as in controls. The degenerative features in alveolar epithelium and alveolar capillary endothelium were more pronounced in animals killed 12 hr after paraquat injection. Some membranous pneumocytes were desquamated, leaving the basement membrane denuded. In these areas the alveolar lining layer was contaminated with cellular debris. The findings of this study, combined with those from earlier studies, suggest that in paraquat poisoning there is derangement of the pulmonary surfactant system by way of at least two mechanisms: first, the degeneration of alveolar epithelium, and second, the contamination of the alveolar lining layer with cellular debris from degenerating epithelial cells. It is suggested that a similar mechanism, perhaps contamination of the hypophase with plasma leaking out through the damaged alveolar wall, is responsible for the inactivation of surfactant as evidenced by pulsating bubbles as early as 8 hr after paraquat injection.

76-1459. Julkunen, R. J. K.; Kekki, M.; Himberg, J. J.; Wahlstrom, B. (Dep. Pharmacol., Univ. Helsinki, Helsinki, Finland). **Non-linear multicompartment model for drug binding by extracellular proteins with an application to warfarin.** *Acta Pharmacol. Toxicol.* 38(2): 90-103; 1976. (35 references)

Formulas are presented for the multicompartment modeling of drug binding to plasma proteins based on nonlinear saturation kinetics. Two- and three-compartment solutions are described in more detail. The data concerning warfarin binding to rat plasma proteins fitted well to a three-compartment model, indicating two binding sites. The amount of free drug increased from 4% at concentrations less than 10 μg/ml to 39% at a concentration of 500 μg/ml. The mean extravascular extracellular protein concentration and the size of the extracellular space of the rat were calculated with constants obtained from the literature and a curve was constructed describing the theoretical warfarin binding in the extravascular extracellular space. The binding percentage of the second binding system was greater than that of the first system at high total drug concentrations. The second binding system also had a more prominent role in the extravascular space than in the plasma, even at relatively low total warfarin concentrations. The present approach may provide a useful and practical way of calculating drug binding to extracellular proteins.

76-1460. Guzman, J. A.; Guardia, T.; Puchmuller, A.; Ojeda, N. S. (Pharmacol. Dep., Sch. Sci., National University of Cuyo, San Luis, Argentina). **Efectos de un insecticida organofosforado sobre las actividades colinesterasicas de *Bufo arenarum* (H) y *Lumbricus terrestris*. [Effects of a phosphorylated insecticide on the cholinesterase activities of *Bufo arenarum* and *Lumbricus terrestris*.]** *Acta Physiol. Lat. Am.* 23(1): 72; 1973. (Spanish)

The application of 118 mg/m^2 of parathion was studied as to its effect on the cholinesterase activity in the cerebrum and bloodstream of *Bufo arenarum* and *Lumbricus terrestris*. In the case of the toad, a significant decrease in cholinesterase activity is partly antagonized by 2-PAM (pralidoxime). When parathion is injected at the rate of 30 mg/kg into the toad, the action is less than with fumigation. In the case of the earthworm, the same fumigation dosage of parathion significantly decreases cholinesterase activity in the brain areas and extremities between the second week and the second month of observation. Motility was not affected. The slower reaction of the earthworm could be attributed either to a slow absorption rate or to a lesser enzymatic sensitivity.

76-1461. Schanzel, H.; Chemtai, A. K. (Univ. Sch. Vet. Med., Brno, Czechoslovakia). **Comparative trials on the efficiency and toxicity of toxaphene (coopertox), chlorfenvinphos (supona) and oxinothiophos (bacdip).** *Acta Vet. Brno* 43(3): 257-271; 1974. (38 references)

The rate of kill of *Rhipicephalus appendiculatus*

and *Ambylomma variegatum* on the hair of cattle treated with toxaphene, chlorfenvinphos, and oxinothiofos was inversely related to the amount of rainfall the animals were exposed to after spraying. The deterioration of oxinothiofos was slower than that of the other two insecticides, although the residual effect of the three acaricides decreased at about the same rate. All three compounds should be applied bi-weekly to assure protection against tick-borne diseases. Toxaphene caused 30% mortality in mice dipped 12 times in 4 wk and 10% mortality in mice dipped eight times in the same period. Toxaphene also caused a significant weight loss, while chlorfenvinphos had little effect and oxinothiofos had none. Toxaphene residues accumulated in proportion to the number and frequency of dippings and were eliminated slowly. The cumulation of the organophosphorus insecticides was proportional to the frequency of dipping, and the residues were eliminated with a half-life of 24 hr. Acetylcholinesterase activity was little inhibited in mice or cattle by toxaphene; the inhibition due to oxinothiofos disappeared within 48 hr in mice and 24 hr in cattle, and the inhibition due to chlorfenvinphos disappeared within 72 hr in mice and 48 hr in cattle. It is concluded that the three acaricides are equally efficient against ticks, but that from a toxicological point of view oxinothiofos is superior to chlorfenvinphos and both are superior to toxaphene.

76-1462. Narahashi, T. (Dep. Physiol. Pharmacol., Duke Univ. Med. Cent., Durham, NC). **Effects of insecticides on excitable tissues.** *Adv. Insect Physiol.* 8: 1-93; 1971.

The actions of insecticides on the nervous system may be classified into three categories: functional changes in the nervous system as a result of insecticide intoxication; biochemical mechanisms which are responsible for the functional change; and biophysical or physicochemical mechanisms which are responsible for the functional changes. The mechanism of nerve excitation is discussed briefly, after which changes in nervous function caused by insecticides are described. The mechanism of action at the cellular or membrane level is also considered, as are the electrophysiological techniques which are used to study the mode of action of insecticides. The latter topic includes the mechanism involved in the temperature effect on insecticidal activity, the resistance of insects to insecticides, and the structure-activity relationship. Specific insecticides which are covered include DDT, lindane, cyclodienes, pyrethroids, rotenone, and the organophosphates.

76-1463. Mueller, G.; Hickisch, B. (Martin Luther Univ., Dep. Soil Sci. Microbiol., Halle, DDR). **Herbicidek hatasa a talajmikroorganizmusok dinamikajara. [Effects of herbicides on soil microorganisms.]** *Agrartud. Kozl.* 33(1): 17-24; 1974. (Hungarian)

The effects of certain herbicides on the population dynamics of soil microorganisms were studied under natural conditions and in model experiments. Spritzhormit (methoxypolyethylene glycol ester of 2,4-D), applied at the usual dose of 1.5 kg/ha, caused no marked change in the bacterial population during the first 36 days, while a 3 kg/ha dose stimulated the proliferation of microorganisms for 18 days. Actinomycetes were stimulated by both doses. The 3 kg/ha dose caused a temporary stimulation of soil fungi. Both concentrations caused a considerable increase in the cellulolytic, proteolytic, and nitrifying microorganisms without affecting sporiferous bacteria. Simazine, applied at doses of 4 and 8 kg/ha, stimulated soil bacteria and actinomycetes, and the higher dose stimulated the cellulolytic bacteria and fungi. Marked depression of proteolytic microorganisms was observed from the 70th day after treatment. Model experiments with Spritzhormit and simazine on *Mucor racemosus*, *Penicillium nigricans*, *P. frequetans*, *Aspergillus niger*, *M. griseocyanus*, *Fusarium oxysporum*, *F. equiseti*, *Trichoderma viride*, *A. fumigatus*, *Perisporium vulgare*, *Rhizopus nigricans*, *A. candidus* and three Mycelia sterilia revealed 50% depression after 400-fold the usual Spritzhormit dose in 7/15 species. The herbicide-induced depression was considerably counteracted by nitrogen-potassium-phosphorus fertilization.

76-1464. Mendoza, C. (Microbiol. Dep., Sch. of Sci., Univ. Madrid, Spain). **Effectos de cinco insecticidas sobre el cremiento de *Azotobacter chroococcum* y *Rhizobium trifolii*. [Effects of five insecticides on the growth of *Azotobacter chroococcum* and *Rhizobium trifolii*.]** *An. Inst. Nac. Invest. Agrar. Ser. Gen.* 2: 21-35; 1973. (11 references) (Spanish)

The insecticides DDT, sevin (carbaryl), menazon, rogor (dimethoate), and malathion were tested as to their influence on the growth of two species of nitrogen-fixing bacteria: *Azotobacter chroococcum* and *Rhizobium trifolii*. When DDT concentrations of 5,000 and 10,000 ppm were applied, this considerably retarded the growth of *Azotobacter chroococcum*, although this strain is known to be capable of adapting to the insecticide. Menazon has no effect on the population growth of Azotobacter below concentrations of 100 ppm, but it favors the production of pigment and growth at concentrations between 500 and 5,000 ppm. The growth of the Rhizobium was affected by DDT or menazon at concentrations between 10 and 1,000 ppm. Sevin at concentrations above 1 ppm, rogor above 50 ppm, and malathion above 100 ppm reduced the growth of Azotobacter, while 10 ppm of sevin, 300 ppm of malathion, and 10 ppm of rogor affects Rhizobium growth. The bacteriostatic concentrations for Azotobacter are 300 ppm sevin, 1,000 ppm rogor, and 500 ppm malathion, while for Rhizobium these are 50, 3,000, and 500 ppm, respectively.

76-1465. Glazer, E. (Dep. Pathol., Cornell Med. Coll., New York, NY). **The neuropathology of organophosphorus toxicity at the cat soleus neuromuscular junction.** *Anat. Rec.* 184(3): 411-412; 1976.

Effects of diisopropyl fluorophosphate (DFP, 2

mg/kg) was injected through the right femoral artery and the cat soleus neuromuscular junctional region was studied using light and electron microscopy techniques. The animals were studied at 1 to 2 week intervals for 8 weeks. A flattening and widening of the primary synaptic clefts, loss of junctional folds, and degeneration within the subneural apparatus were noted 7 days after DFP injection. At this time the motor nerve terminals appeared unaffected. Focal centromyofibrillar disorganization was also noted in the vicinity of the endplate. Regeneration of the postjunctional apparatus had started by day 14. The first signs of motor nerve terminal degeneration were noted in conjunction with this restoration of normal muscle organization. Between days 14 and 28, the number and severity of axon terminals affected increased. Only in conjunction with extensive axonal degeneration was secondary postjunctional atrophy noted. Between days 28 and 56 reinnervation of the neuromuscular junctions occurred. Reinnervation following the delayed neuropathy was accomplished by sprouting from the undamaged portions of the original axon to that endplate. The formation of multiple endplates on single muscle fibers further demonstrated the disruption in the normal nerve muscle relationship. From the results of this study it appears that the acute and chronic lesions produced reflect a direct sequential action of DFP on both muscle and nerve. The mechanisms of these actions are not known.

76-1466. Holt, T. M.; Chopin, S. F. (Dep. Anat., Univ. South Florida Coll. Med., Tampa, FL). **The effect of an acetylcholinesterase inhibitor (disulfoton) on hippocampal catecholamines in the rat.** *Anat. Rec.* 184(3): 431-432; 1976.

A possible catecholamine release in peripheral sympathetic terminals brought about by cholinergic stimulation was studied in female Sprague-Dawley rats, given injections of disulfoton (1.0 mg dissolved in 0.5 ml corn oil) at 15 hr intervals. The animals were sacrificed at 3 hr after the second injection. The hippocampi were removed. The catecholamines were recovered and purified on a weak ion exchange column following tissue homogenization. Using a trihydroxyindole technique, fluorophores of the purified catecholamine samples were formed. Spectrophotofluorometric methods were used to determine relative fluorescence. The data from the study indicated that disulfoton caused a significant increase in hippocampal norepinephrine content. This finding supports the theory of direct interrelationships between cholinergic and catecholaminergic transmission in the central nervous system.

76-1467. Krause, W.; Hamm, K.; Weissmueller, J. (Dep. Androl., Justus Liebig Univ., Giessen, Germany). **Die Wirkung peroraler Gaben von DDVP und Malathion auf Spermatogenese und Leydigzellen der juvenilen Ratte. [The effect of peroral doses of DDVP and malathion on spermatogenesis and Leydig cells of the juvenile rat.]** *Andrologia* 7(2): 109-116; 1975. (12 references) (German)

Immature male rats received 20 mg/kg DDVP (dichlorvos) orally on days 4 and 5 of life, and others received 10 mg/kg on days 4 and 24. Other rats received 40 mg/kg malathion or 20 mg/kg on the same schedules. On defined days the testes were examined histologically. The body weight did not change, but the testis weight, tubular diameter, number of Sertoli cells and A-spermatogonia per tubular cross section, and number of Leydig cells decreased. Although malathion produced more and more severe changes, these disappeared by the fiftieth day of life. One would expect these results from a local lack of testosterone caused by the metabolic effects of organophosphates.

76-1468. Costantini, F.; Andreoli, V. (Ist. Zool. Gen., Univ. Perugia, Perugia, Italy). **Erbicidi e fauna. Nota I: effetti degli erbicidi sullo sviluppo embrionale e post embrionale di *Bufo vulgaris* L. [Herbicides and fauna. I. Effects of herbicides on the embryonic and post-embryonic development of *Bufo vulgaris* L.]** *Ann. Fac. Agrar. Univ. Studi Perugia* 27: 225-236; 1972. (6 references) (Italian)

The effects of Dosanex (metoxuron, LD50 1600-2000 mg/kg), Pyramin (pyrazon, LD50 2600 mg/kg), and Tribunil (methabenzthiazuron, LD50 2500 mg/kg) were studied on the embryonic and larval development of *Bufo vulgaris* L. The pesticides were used at concentrations of 0.50, 0.25, 0.15, 0.10, 0.05, and 0.025% in water. At dilutions of 0.5 and 0.25%, all three herbicides produced high mortality in both the embryos and the larvae. At 0.05 and 0.025%, Dosanex and Pyramin are hardly toxic to the frog embryos, while they are significantly more so for the larvae; Tribunil is very toxic to both the embryos and the larvae at this level, and all are more toxic at the higher doses.

76-1469. Albrecht, R.; Pelissier, M. A.; Manchon, P.; Dupuis, D. (Lab. Biol., Inst. Sci. Tekh. Aliment., Paris, France). **Influence de l'administration de parathion-methyle ou de zinebe sur l'activite de quelques enzymes hepatiques chez le rat. [Effects of methyl parathion and zineb on the activity of certain liver enzymes the in rat.]** *Ann. Nutr. Aliment.* 29(3): 223-238; 1975. (35 references) (French)

The food of male rats was dosed daily with methyl parathion or zineb in quantities of 1/20 or 1/10 LD50 per day. Administration lasted 4 or 8 weeks. The activity of liver microsomal enzymes was measured; these included aminopyrine *N*-demethylase, BHT oxidase, aniline hydroxylase, butter yellow and amaranth reductases, NADPH-cytochrome c reductase, and G6P phosphatase. The administration of methyl parathion led only to a lowering of the microsomal protein concentration. Zineb produced various effects, such as a lower rate of microsomal metabolism of foreign compounds. This regressive effect changed during the administration period and varied with the substrate used. This effect was noted after 4 weeks for BHT oxidase, but not after 8 weeks. It increased between 4

and 8 weeks for aminopyrine *N*-demethylase, but was the same after the two periods for aniline hydroxylase. The activities of G6P phosphatase and G6P and 6PG dehydrogenases were not modified by the ingestion of either pesticide.

76-1470. Lutz-Ostertag, Y.; Lutz, H. (Lab. Biol. Anim., Univ. Clermont, 63170 Aubiere, France). **Sexualite et Pesticides.** [**Sexuality and pesticides.**] *Ann. Biol.* 13(3-4): 173-185; 1974. (11 references)s(French)

Experiments on the gonadotropic action of parathion, azinphos, aldrin, endosulfan, DDT, 2,4-D, 2,4,5-D, simazine, and paraquat are reviewed in chickens, quail, pheasant, and common and red-legged partridge. Treatment of the eggs with these pesticides resulted in disturbances in embryonal morphogenesis, increased embryonal mortality, reduced hatching rate, and often in feminization in males and superfeminization of females, and in consistently reduced fertility. The second generation issuing from specimens hatched from eggs treated with DDT and 2,4-D show the same malformations of the genitals and reduced fertility as did the first generation. Considerable differences were observed in the susceptibility of different species to the same pesticide.

76-1471. Desi, I.; Dura, G.; Gonczi, L.; Kneffel, Z.; Strohmayer, A.; Szabo, Z. (Natl. Inst. Public Health and Hyg., Div. Hyg. Biol., Budapest, Hungary). **Toxicity of malathion to mammals, aquatic organisms and tissue culture cells.** *Arch. Environ. Contam. Toxicol.* 3(4): 410-425; 1976. (35 references)

The effect of malathion on rats (75 and 38 mg/kg body weight), aquatic organisms (100 to 0.001 mg/L), and cells in tissue culture (1000 to 1 ppm) was studied. The conventional toxicological tests conducted for 90 days on rats yielded negative results. ChE activity was determined in plasma, liver, brain and erythrocyte samples. It was significantly reduced in the erythrocytes of animals treated with the larger dose for 21 days and in the cerebral cortex of rat fed either of the doses. ChE activity of rats consuming malathion for 90 days did not differ significantly from that of the controls. In contrast, the psychophysiological examinations utilized in the experiments indicated abnormalities within 21 days. Alterations were observed in the EEG and EMG records after 90 days of feeding. Malathion had a definitely harmful effect on phylogenetically and ontogenetically young aquatic organisms, as well as on the cells of monkey kidney culture. The latter finding suggests that the preparation has a direct destructive effect on cells. Although it is not suggested that malathion should be regarded as a toxic agent, thus requiring limitation of application, attention is directed to the fact that inconsiderate use of the preparation may involve potential dangers for man and his environment. (Author abstract by permission)

76-1472. Nigg, H. N.; Metcalf, R. L.; Kapoor, I. P. (Univ. Florida, Agr. Res. Educ. Cent., Lake Alfred, FL 33850). **DDT and selected analogues as microsomal oxidase inducers in the mouse.** *Arch. Environ. Contam. Toxicol.* 3(4): 426-436; 1976. (37 references)

The potential was studied of DDT analogues to raise or lower the level of hepatic multifunctional oxidase enzymes (MFO) in the mouse. Sixteen compounds were tested. They were administered i.p. at 100 mg/kg for five consecutive days to male mice of the CF-1 strain. DDT and its analogues significantly changed the level of MFO epoxidation, sulfoxidation, cytochrome P-450, *O*-demethylation and ring hydroxylation, but did not elevate *N*-demethylation activity. DDT and DDE were equally effective in elevating MFO activity, producing levels of 140 to 278% of controls for all reactions except *N*-demethylation. Ethoxychlor was also an effective inducer producing elevated levels of epoxidation, sulfoxidation, and cytochrome P-450 from 145 to 195% control levels. Methoxychlor significantly elevated only sulfoxidation and significantly depressed *N*-demethylation and cytochrome P-450 levels. Methylchlor also significantly increased only sulfoxidation. Methiochlor increased epoxidation, *O*-demethylation, sulfoxidation, and cytochrome P-450. Diphenyltrichloroethane was not an inducer in this study. Nitro-DDT showed a significant increase only in *O*-demethylation.

76-1473. Jonsson, H. T., Jr.; Keil, J. E.; Gaddy, R. G.; Loadholt, C. B.; Henniger, G. R.; Walker, E. M., Jr. (Dep. Biochem., Med. Univ. South Carolina, Charleston, SC 29401). **Prolonged ingestion of commercial DDT and PCB; effects on progesterone levels and reproduction in the mature female rat.** *Arch. Environ. Contam. Toxicol.* 3(4): 479-490; 1976. (20 references)

A report linking human polycystic ovaries with increased exposure to environmental DDT prompted the present study comparing effects of PCB and DDT or their combination on reproduction in female rats under more realistic conditions with respect to level (75 and 150 ppm), route of administration (dietary contaminant), and period of exposure (8 to 36 weeks). Evaluation of estrous cycle length, mating frequency, and number and size of litters, as well as plasma levels of DDT, PCB, progesterone (P), and 17 α = hydroxyprogesterone (17 α = OH-P) permitted comparison of short and long term reproductive changes from ingestion of two levels of DDT and/or PCB. PCB reduced plasma progesterone ($p < .01$) while plasma 17 α OH-P was unchanged by PCB or DDT. High DDT and PCB abolished reproduction. Histologically, distinct ovarian stromal changes accompanied 150 ppm of PCB, while increased numbers of more prominent follicular cysts were evident with 150 ppm of DDT. Although DDT and PCB generally reduced or abolished litter production, no treatment tested significantly altered litter size. Long term chronic ingestion of more realistic levels of technical DDT (85% *p,p'*, 15% *o,p'*-DDT) in these studies did not lead to polycystic ovaries in adult rats comparable to those reported following i.v. administration of pure *o,p'*-DDT to immature rats. Plasma DDT levels above 800 ppb are

clearly detrimental to reproduction, while levels below 500 ppb had little effect. It is reported here for the first time prolonged ingestion of PCB (150 ppm) markedly reduces reproduction ($p < .05$) and significantly reduces progesterone in plasma ($p < .01$), as well as producing histologically characteristic ovarian stromal changes not seen with DDT alone. (Author abstract by permission)

76-1474. Casida, J. E.; Ueda, K.; Gaughan, L. C.; Jao, L. T.; Soderlund, D. M. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 74720). **Structure-biodegradability relationships in pyrethroid insecticides.** *Arch. Environ. Contam. Toxicol.* 3(4): 491-500; 1976. (26 references)

The metabolism of 20 pyrethroids has been examined to evaluate the contribution of detoxification in their selective action between insects and mammals. The studies utilized living houseflies, mice, or rats, or esterase and oxidase systems derived from these organisms. Pyrethroid-hydrolyzing esterases cleave the primary alcohol *trans*-substituted-cyclopropanecarboxylates much faster than the corresponding *cis*-isomers but are ineffective in hydrolyzing secondary alcohol esters. Microsomal enzymes oxidize the (+)*trans*-chrysanthemate moiety at the *trans*-methyl group of the isobutenyl substituent and at one of the *gem*-dimethyl groups whereas the (+)*cis*-isomer is attacked at either of the isobutenyl methyl groups. Products isomerized at C_3 of the cyclopropane are also detected but only after ester cleavage and oxidation of an isobutenyl methyl group. Each alcohol moiety has its own unique sites for oxidation involving pentadienyl, allyl, benzylic methylene, and aromatic substituents. An enhancement of insecticidal activity is expected on replacement of the biodegradable groupings with substituents relatively resistant to metabolism but this may also increase the mammalian toxicity. (Author abstract by permission)

76-1475. Anderson, J. P. E.; Domsch, K. H. (Inst. Bodenbiol. Forschungsanst. Landwirtsch., Braunschweig, Germany). **Microbial degradation of the thiolcarbamate herbicide, diallate, in soils and by pure cultures of soil microorganisms.** *Arch. Environ. Contam. Toxicol.* 4(1): 1-7; 1976. (9 references)

The disappearance of the herbicide Avadex (40% diallate) from five agricultural soils (differing in either pH, carbon content, or nitrogen content), incubated under sterile and non-sterile conditions, was followed for a period of 20 weeks. Avadex was rapidly lost from microbiologically active soils, with over 50% of the applied (2.5 ppm) dosage disappearing within four weeks; losses from sterile soils were much slower, with recoveries of over 50% after 20 weeks. Incubation of soil with Avadex to which ^{14}C-labeled diallate had been added resulted in rapid formation of $^{14}CO_2$ from microbiologically active samples and only very slow $^{14}CO_2$ formation from sterile samples. Substantial quantities of radioactivity were retained as unextractable residues in both sterile and non-sterile soils after seven days incubation. From these data it was concluded that the disappearance of the herbicide from non-sterile soils was mainly due to microbial degradation and to binding of diallate or its metabolites as residues to undefined soil components. Losses from sterile soils were attributed to both binding of residues and slow chemical degradation. Avadex degradation by pure cultures was studied using representative fungi isolated from the five soils. Of the fungi tested, *Phoma eupyrena*, *Penicillium janthinellum*, and *Trichiderma harzianium* could degrade at least 20% of the applied (2.5 ppm) herbicide after ten days incubation. Degradation of Avadex in soil cultures of *T. harzianum* was found to be slower than degradation in liquid nutrient cultures. (Author abstract by permission)

76-1476. Mauck, W. L.; Olson, L. E.; Marking, L. L. (Fish Pestic. Res. Unit, La Crosse, WI 54601). **Toxicity of natural pyrethrins and five pyrethroids to fish.** *Arch. Environ. Contam. Toxicol.* 4(1): 18-29; 1976. (23 references)

The toxicity of natural pyrethrins and 5 pyrethroids was determined with coho salmon (*Oncorhynchus kisutch*), steelhead trout (*Salmo gairdneri*), fathead min/now (*Pimephales promelas*), channel catfish (*Ictalurus punctatus*), bluegill (*Lepomis macrochirus*), and yellow perch (*Perca flavescens*). The 96-hour LC50s in static tests at 12°C ranged from 24.6 to 114/μg/l of natural pyrethrins and from 0.110 to 1,140 μg/l of pyrethroids. Two pyrethroids, RU-11679 and SBP-1382, were over 10 times more toxic than pyrethrum extract in the flow-through tests. Coldwater species of fish were more sensitive than warmwater species to all the compounds. Temperature (12-22°C) influences the toxicity of natural pyrethrin and the pyrethroids. The natural pyrethrin was more toxic to fish in pH 6.5 than in pH 9.5 water, but the toxicity of pyrethroids was not influenced in that pH range. The two most toxic pyrethroids, RU-11679 and SBP-1382, were deactivated more rapidly in water solutions than natural pyrethrins, *S*-bioallethrin, dimethrin, and *d*-trans allethrin. (Author abstract by permission)

76-1477. Fuchs, A.; Ost, W. (Lab. Phytopathol., Agric. Univ., Wageningen, The Netherlands). **Translocation, distribution and metabolism of triforine in plants.** *Arch. Environ. Contam. Toxicol.* 4(1): 30-43; 1976. (14 references)

After short-term root-treatment of plants with ^{3}H-triforine (labeled on the piperazine ring) or ^{14}C-triforine (labeled on the side chain), the label was translocated primarily to the leaves present at the time of treatment, without any redistribution of the label taking place after termination of the treatment. Autoradiography showed the radioactivity to be very evenly distributed over the leaf blades, without any appreciable accumulation in leaf margins. In infected leaves, however, there was a tendency for increased accumulation at the infection sites. In dilute aqueous solution triforine was decomposed rather rapidly: the chemical half-life was only three days. From these solutions several non-fungitoxic degradation products have been isolated and their chemical structures deter-

mined. In plants, decomposition of triforine was considerably slower than in aqueous solutions, the half-life of the compound varying depending on plant species. In plants, at least four conversion products could be demonstrated, one of which is piperazine. Whether the other three compounds are identical with or structurally related to the breakdown products found in aqueous solution is not yet known. Its low persistence and low animal toxicity suggest that triforine does not offer serious hazards to the environment. (Author abstract by permission)

76-1478. Locke, R. K.; Chen , J. Y. T.; Damico, J. N.; Dusold, L. R.; Sphon, J. A. (Div. Toxicol., Food and Drug Admin., U.S. Dep. Health, Educ., and Welfare, Washington, DC 20204). **Identification by physical means of organic moieties of conjugates produced from carbaryl by tobacco cells in suspension culture.** *Arch. Environ. Contam. Toxicol.* 4(1): 60-100; 1976. (58 references)

Carbaryl (1-naphthyl methylcarbamate), labeled with ^{14}C in the C_1-naphthyl, carbonyl, or *N*-methyl position, was introduced into the culture medium of tobacco cells in suspension culture. Following incubation, cells were homogenized in water, centrifuged, and supernatants hydrolyzed with β-glucosidase or HCl. Organic moieties were characterized by two-dimensional thin-layer chromatography (TLC), and many were subsequently identified by infrared and mass spectrometry. On the basis of the data obtained with $^{14}C_1$-naphthyl-labeled carbaryl, it appeared that 18.4% of the total characterized metabolites represented unconjugated *N*-CH_2OH-carbaryl [1-naphthyl *N*-(hydroxmymethyl) carbamate], excreted by the cells into the culture medium. The metabolites found in the cells primarily consisted of conjugates of 1-naphthol (73.6% of the total characterized metabolites) and *N*-CH_2OH-carbaryl (2.5%). Conjugates of 7-hydroxycarbaryl (7-hydroxy- 1-naphthyl methylcarbamate), 4-hydroxycarbaryl (4-hydroxy- 1-naphthyl methylcarbamate), and 5-hydroxycarbaryl (5-hydroxy-1-naphthyl methylcarbamate) were also detected in small amounts. Of five unknown $^{14}C_1$-naphthyl-labeled carbaryl metabolites, three were tentatively characterized as: *O*-1-naphthylcholesterol (cholest-5-en- 3β-yl-1-naphthol; 3.0%); an unconjugated hydroxylated 1,4- dihydro-1,4-epiperoxynaphthalene (1.4%); and an acid-labile, β-glucosidase-resistant conjugate of a *cis*-dihydrodiol of 1-naphthol (0.3%; other than the *trans*-5,6-dihydrodiol). The cholesterol derivative may represent a new "detoxification mechanism" in plants; the epiperoxide may help to elucidate plant oxidation mechanisms. A new TLC procedure was developed which successfully separated the acetate derivative of *N*-hydroxycarbaryl (1-naphthyl *N*-hydroxy- *N*-methylcarbamate) from 12 other common moieties of carbaryl metabolites and their acetate derivatives. A new two-dimensional TLC system was developed for the separation of underivatized *N*-hydroxycarbaryl from 14 other moieties of carbaryl metabolites; two additional two-dimensional TLC systems were utilized for moiety separations. With these TLC procedures, no conjugated or unconjugated *N*-hydroxycarbaryl could be detected in any tobacco cell culture fraction after incubation of cells in medium containing radiolabeled carbaryl. Authentic $^{14}C_1$-naphthyl-labeled *N*-CH_2OH-carbaryl was shown to be converted to desmethylcarbaryl (1-naphthylcarbamate) (97%) and 1-naphthol (3%) by 0.1*N* HCl hydrolysis. (Author abstract by permission)

76-1479. Viviani, R. (Univ. Bologna, Bologna, Italy). **Aspetti biochimici nell'ecologia dei pesticidi. [Biochemical aspects of pesticide ecology.]** *Atti Soc. Ital. Sci. Vet.* 27: 129-135; 1973. (25 references) (Italian)

Pesticides act mainly at the enzymatic and macromolecular levels. To understand their mechanism of action, it is necessary to study the biochemical lesions caused by these substances along with their degradability and bioconcentration, and the ADI with reference to the molecular level. Biochemical lesions vary from pesticide to pesticide, encompassing interference with processes such as RNA synthesis, redox reactions, photosynthesis, oxidative phosphorylation, ATP synthesis, and biochemical activity of mitochondria and the endoplasmic reticulum. Biological and nonbiological mechanisms can degrade and detoxify pesticides; clay and other colloidal material will adsorb and inactivate pesticides and photochemical reactions will volatilize and degrade them. Biological processes are most effective in destroying pesticides through soil and water microflora. Factors which enhance molecular persistence (slow degradation) include anaerobiosis or the lack of electron acceptors, adsorption, movement of a substrate towards greater depths to escape microbial action, and molecular structure. Pesticides can also be degraded by microorganisms which possess or acquire transfer factors containing genetic coding for enzymes capable of degrading persistent molecules; this has been demonstrated for phenoxyacetic acid herbicides.

76-1480. Rose, M. S.; Lock, E. A.; Smith, L. L.; Wyatt, I. (Biochem. Mech. Unit., Imp. Chem. Ind., Ltd., Cent. Toxicol. Lab., Macclesfield, Cheshire, England). **Paraquat accumulation: tissue and species specificity.** *Biochem. Pharmacol.* 25(4): 419-423; 1976. (20 references)

Rat tissues have been examined in vitro for their ability to accumulate paraquat or diquat to concentrations in excess of those present in the incubation medium. With a concentration of 10 μM lung slices were able to accumulate paraquat to concentrations nearly ten times that of the medium, and brain slices to concentrations double that of the medium, over a period of two hours. Neither slices of lung nor brain accumulated diquat significantly from a concentration in the medium of 10 μ*M*. The accumulation of paraquat by brain slices, like that of lung slices, has been shown to be energy-dependent. Other organs examined showed little, if any, ability to accumulate either paraquat or diquat. Lung slices from dog, monkey and rabbit have also been shown to possess the ability to accumulate

paraquat in vitro. After oral dosing of paraquat to rats, the lung concentration increased with time to six times that of the plasma after 30 hr. Other organs, with the exception of the kidney, did not concentrate paraquat to the same extent. Kidney concentrations after oral dosing of both paraquat and diquat were high throughout the period of time studied. It is, therefore, suggested that the apparent selectivity exhibited by paraquat for the lung is associated with the accumulation process. (Author abstract by permission)

76-1481. Mendoza, C. E.; Augustinsson, K. B.; Axenfors, B. (Food Res. Div., Health Protect. Br., Natl. Health Welfare, Ottawa, Ontario, Canada). **Some properties of isolated pig plasma esterases sensitive to 3,5-di-*t*-butylphenyl methylcarbamate (butacarb).** *Biochem. Pharmacol.* 25(6): 701-705; 1976. (24 references)

Some properties of pig plasma esterases were determined using as substrates thiophenyl acetate, phenylacetate, acetylthiocholine iodide, and butyrylthiocholine iodide. Under similar conditions, butacarb (3,5-di-*t*-butylphenyl methylcarbamate) was found to be a much more potent inhibitor than carbaryl (1-naphthyl methylcarbamate). High specific activity fractions were obtained by ammonium sulfate precipitation followed by chromatography on Sepharose 6B. The butacarb-sensitive esterases were adequately separated from albumin by Sepharose 6B. The active fractions were inhibited by mercuric, cobalt, and manganese ions, and not by calcium and potassium ions or by Mipafox, an organophosphorus compound. Also, they were free of any cholinesterase activity. The properties observed indicated an arylesterase type of enzyme. (Author abstract by permission)

76-1482. Proctor, N. H.; Moscioni, A. D.; Casida, J. E. (Kaiser Found. Int., Oakland, CA 94666). **Chicken embryo NAD levels lowered by teratogenic organophosphorus and methylcarbamate insecticides.** *Biochem. Pharmacol.* 25(7): 757-762; 1976. (35 references)

Many organophosphorus (OP) and methylcarbamate (MC) insecticides and related compounds, when injected into the yolk sac on day 4 of incubation, markedly lower chicken embryo NAD levels at day 12 of incubation. The same compounds also produce drastic developmental defects, suggesting that the lowered level of NAD may be the cause of teratogenesis. The most potent OP compounds of those tested are diazinon and dicrotophos, acting at 0.1 and 1 mg/kg respectively, while the MC compounds eserine sulfate and carbaryl are effective at 1 and 4 mg/kg respectively. The injection of nicotinamide and other NAD precursors prevents the decrease in NAD levels and alleviates most of the teratogenic signs. Previous hypotheses, including that relating the inhibition of yolk sac membrane esterases to embryonic abnormalities, are less satisfactory or are inadequate to explain this type of chemically induced teratogenesis. Areas remaining to be defined are the biochemical lesion leading to decreased chicken embryo NAD levels and the relevance of these findings to mammals. (Author abstract by permission)

76-1483. Binder, N.; Landon, E. J.; Wecker, L.; Dettbarn, W. D. (Dep. Pharmacol., Vanderbilt Univ. Sch. Med., Nashville, TN 37232). **Effect of parathion and its metabolites on calcium uptake activity of rat skeletal muscle sarcoplasmic reticulum in vitro.** *Biochem. Pharmacol.* 25(7): 835-839; 1976. (27 references)

The insecticide parathion and its potent anticholinesterase metabolite paraoxon induce skeletal muscle necrosis when administered in vivo to rats. In the present study the effects in vitro of parathion and its metabolites on microsomal (sarcoplasmic reticular) calcium uptake activity in rat diaphragm skeletal muscle are examined. Parathion (0.05 m*M*) is a potent inhibitor of this calcium uptake. The inhibition is apparently competitive with calcium in the system. Parathion (0.05 m*M*) is also shown to inhibit calcium-dependent ATPase activity associated with the microsomal calcium uptake. Paraoxon, the active anticholinesterase metabolite of parathion, and *p*-nitrophenol, a hydrolytic metabolite of paraoxon, have no inhibitory effects at this level. At 1.5 m*M* levels they do inhibit the skeletal muscle microsomal calcium uptake. Eserine, a chemically unrelated anticholinesterase agent, also has inhibitory effects at 1.5 m*M*. When these same compounds are incubated with isolated rat hemidiaphragms they antagonize the muscle contraction elicited by direct stimulation of the muscle. The skeletal muscle necroses caused by parathion and paraoxon appear to relate to the anticholinesterase activity in vivo. The relatively potent inhibition of calcium uptake activity of sarcoplasmic reticulum in vitro seen with parathion appears to be an independent action and not related to cholinesterase inhibition. (Author abstract by permission)

76-1484. Litzbarski, B.; Litzbarski, H. (Lehrst. Tierphysiol., Sekt. Chem./Biol., Paedagog. Hochsch., Potsdam, DDR). **Hemmung der Acetylcholinesterase durch Toxaphen in Insekten und Fischen. [Inhibition of acetylcholinesterase by toxaphene in insects and fish.]** *Biol. Rundsch.* 12(5): 345-346; 1974. (7 references) (German)

Toxaphene has a strong anticholinesterase activity in fish as well as insects. In vitro tests on whole-body homogenates of *Musca domestica* and *Galleria mellonella* showed a 90% inhibition of acetylcholinesterase with only 0.1% toxaphene in *Galleria mellonella* while in *Musca domestica* the inhibition reached only 70%. In carp (*Cyprinus carpio*) a lethal dose of 0.5-0.75 mg/l inhibited acetylcholinesterase in blood plasma 20-35%, but in erythrocytes the level rose by 40-50%. A sublethal dose of 0.01 mg/l reduced the acetylcholinesterase by more than 50% in blood plasma and raised it in the erythrocytes by 20%.

76-1485. Miyata, T.; Saito, T. (Lab. Appl. Entomol. Nematol., Fac. Agric., Nagoya Univ., Chikusa, Nagoya,

Japan). [**Change in free amino acid contents in the cockroach and the brain of the mouse poisoned with NS 2662.**] *Bochu-Kagaku (Sci. Pest Cont.)* 38(2): 92-99; 1973. (22 references) (Japanese)

Changes in the free amino acid contents in the cockroach and mouse brain were studied after exposure to NS-2662, DMVP, trichlorfon, and dichlorvos. Seventeen amino acids, including proline, glutamine, glutamate, and alanine were detected in the cockroach as free amino acids along with two ninhydrin positive substances. GABA was detected in the cockroach nerve tissue. In the mouse brain, besides these 17 amino acids, GABA, taurine, and one ninhydrin positive substance were detected. During insecticide poisoning the proline and alanine contents in the cockroach whole body decreased. At the convulsive and paralyzed stages, glutamine content increased and glutamate content decreased. In the nerve tissue of paralyzed cockroaches, GABA, glutamate, and alanine contents decreased. In the brain of mice exposed to the insecticides, glutamine content increased but glutamate remained almost the same as controls. Alanine content increased temporarily and then decreased. A slight decrease was noted in the GABA content of the brains of NS 2662 poisoned mice. A slight increase in GABA content was noted in the brains of mice poisoned with the other insecticides.

76-1486. Kawai, M.; Tojo, K.; Miyazawa, S.; Maruta, H.; Naito, M. (Med. Sch., Ground Self-Defense Force, Tokyo, Japan). [**Experimental studies on the effects of organophosphorus compounds on the eyes.**] *Boei Eisei (Natl. Defense Med. J.)* 23(1): 1-10; 1976. (8 references) (Japanese)

Effects of two organophosphorus insecticides, fenthion and fenitrothion, were studied on rat and rabbit. A daily diet containing 300 ppm fenthion was given to 8 groups of Donryu rats: a hare's eye group, a sutured eyelid group, a cervical sympathectomy group, a group given antibiotic eye ointment, a group given atropine eye drops, and groups given subcutaneous injections of pralidoxime, atropine, and GSH for about one month. All animals given fenthion p.o. showed typical general symptoms of organophosphorus intoxication such as nervousness, general spasms, diarrhea, and salivation, and ophthalmological symptoms, such as eyeball protrusion, keratoconus, mammiform cornea, and corneal turbidity. The pretreatments described showed no effect in preventing these ocular symptoms (incidence or extent). The injections were effective in descending order of atropine, pralidoxime, and GSH. Ocular symptoms developed later than the general symptoms. Rabbits were exposed to a fenitrothion spray at concentrations of 0.24 and 2 ppm, 30 min-2 hr/day for 32 weeks. No symptoms were recognized in the rabbits exposed to 0.24 ppm of fenitrothion. The rabbits exposed to the denser mist show decreasing corneal radius of curvature over time.

76-1487. Huaman, B.; Tomashiro, J.; Cotillo, P. (Dep. Pharm., Univ. Nac. Mayor de San Marcos, Lima, Peru.) **Activadad farmacologica del 2-isopropoxi-fenil *N*-metil carbamato. [Pharmacological activity of 2-isopropoxyphenyl-*N*-methyl carbamate.]** *Bol. Soc. Quim. Peru* 38(2): 100; 1972. (Spanish)

In a study of the commercial non-phosphorus organic insecticide Baygon (propoxur, 2-isopropoxyphenyl-*N*-methyl carbamate), a notable anticholinesterase activity was observed in the isolated ileum of rats, and also a marked influence on the blood pressure of these animals. The activity of this insecticide was compared with that of prostigmine, a reversible acetylcholinesterase inhibitor, as well as liquid Folidol M, an irreversible inhibitor. Results indicate that Baygon is 100 times less active than prostigmine in its potentiation of the response to acetylcholine. Baygon actually exerts a 2-phase action on blood pressure in rats; it causes a rapid drop in pressure, then potentiates the hypertensive action of the acetylcholine, which is itself a strong, long-acting hypertensive agent.

76-1488. Stein, V. B.; Pittman, K. A.; Kennedy, M. W. (Inst. Comp. Human Toxicol., Albany Med. Coll., Albany, NY 12208). **Characterization of a mirex metabolite from monkeys.** *Bull. Environ. Contam. Toxicol.* 15(2): 140-146; 1976. (18 references)

High pressure liquid chromatographic characterization is reported of the suspected mirex metabolite found in extracts from the feces of rhesus monkeys (*Macaca mulatta*) given i.v. doses of C-14-Mirex (1 mg/kg). The chromatographic system used clearly separated the suspected metabolite from the $C_{10}H_2Cl_{10}$ derivatives of mirex, both of which had smaller elution volumes. Of the $C_{10}HCl_{11}$ derivatives, one had an elution volume slightly smaller and the other slightly larger than the suspected metabolite. Although the metabolite and both of the $C_{11}HCl_{11}$ derivatives behaved similarly, the differences in elution volumes were invariably maintained when the analysis was repeated. The possibility that the suspected metabolite was an oxidation product of mirex which was retarded in the reverse-phase chromatographic system due to interaction with the solid support or column tubing was dismissed. The amount of the compound obtained by combining all fecal extracts was insufficient for location on gas chromatography or for purification for mass spectrometry. It is suggested that the metabolite resulted from bacterial action in the lower gut or in the feces, as no evidence of a metabolite was found in extracts of fat where the concentration of radioactivity was always several orders of magnitude larger than in the feces. From the results of this study it is concluded that the behavior of the suspected metabolite is consistent with that of a non-polar derivative of mirex.

76-1489. Paul, B. S.; Vadlamudi, V. P. (Dep. Pharmacol., Punjab Agric. Univ., Ludhiana, India). **Teratogenic studies of fenitrothion on white leghorn chick embryos.** *Bull. Environ. Contam. Toxicol.* 15(2): 223-229; 1976. (13 references)

The effects were studied of fenitrothion on embryonic development and post-hatch growth rates of White Leghorn chickens. Eggs were inoculated with 0.1 ml of 0.1, 1, 5, 10, 20, and 30% fenitrothion. Fenitrothion concentrations of 0.1, 0.5, and 1% were selected for studies of the effects of fenitrothion on the embryo during the 4th to the 12th day of incubation. The 0.1% concentration was used in subsequent stages of embryonic development. Fenitrothion in concentrations of 5 to 30% produced lethal effects to all embryos and in concentrations of 0.1 and 1% caused 40 and 30% hatch, respectively. Chicks hatched from 0.1 and 1% fenitrothion treated eggs were dwarfed and showed visible abnormalities such as curled toe, leg weakness, and abnormal gait. The results of this study show that the body weight of chicks on the day of hatch was less in fenitrothion treated chicks in all trials as compared to controls. Fenitrothion treatment during days 4 to 12 of incubation was particularly toxic. In experiments where fenitrothion was injected at 0.1% during days 8-12, 10-12, and on the 12th day, it became clear that the hatchability rate increased with the advancement of incubation, and it was maximum (80%) on the 12th day as compared to 53.6% during the 8th-12th and 60% during the 10th-12th day. In comparison with malathion, where the teratogenic dose was 3.99 to 6.22 mg/egg, the teratogenic dose (0.01 to 1 mg/egg) of fenitrothion used in this study is comparatively far less and it is thus concluded that fenitrothion is more toxic than malathion to chick embryos. The effect of fenitrothion on the growth rate may be due to adverse effects of the insecticides on the growth promoting endocrine glands or it may also be due to the inhibited utilization of several metabolites such as nicotinamide, nicotinic acid, quindic acid, and tryptophan during embryonic development.

76-1490. Williams, I. H.; Pepin, H. S.; Brown, M. J. (Res. Stn., Agric. Canada, Vancouver, British Columbia, Canada). **Degradation of carbofuran by soil microorganisms.** *Bull. Environ. Contam. Toxicol.* 15(2): 244-249; 1976. (4 references)

The degradation of carbofuran by soil microorganisms was studied and an effort was made to identify the more active organisms involved. The effect of microbial degradation was measured by comparing the rate of release of ^{14}C labeled carbon dioxide from sterile and nonsterile samples of the same soil treated with ^{14}C labeled carbofuran. During the second week of the experiment the rate of degradation of carbofuran was 40 times greater in the non-sterile than in the sterile soil. After 8 weeks incubation the total ^{14}C in the soil revealed that the amount of carbofuran remaining in the non-sterile soil had decreased to less than 60% of the applied amount. In the sterile soil no measurable loss had occurred. Some of the actinomycetes were particularly active. This study also showed that serious losses can occur between the time of sampling the soil and its eventual analysis if the sample is not kept at subzero temperatures during the waiting period. From this study it is concluded that in a soil containing high levels of actinomycetes, rapid degradation of carbofuran may be expected. What in some cases may be viewed as possible build-up of resistance by an insect for which control is desired may be in fact a lowering of the concentration of the insecticide to an ineffective level by microbial degradation.

76-1491. Lutz, H. (Lab. Biol. Anim., Univ. Clermont, Aubiere, France). **Pesticides et reproduction chez les homeothermes. [Pesticides and reproduction in warm-blooded animals.]** *Bull. Soc. Zool. Fr.* 99(1): 49-63; 1974. (57 references) (French)

The effects of different pesticides (organomercurials, organophosphates, organochlorines, and herbicides) are reviewed on embryonic development and viability and on reproduction in Homeothermes. Almost all pesticides analyzed act upon the fetus; sometimes specific chemical classes act in characteristic ways. Organophosphates affect the skeletal structure, producing a decrease in the size of the embryos because of crowding and fusion of the vertebrae. In birds, the gonads are seriously affected, leading to sterility or quasi-sterility of the embryo. Organomercurial compounds are by far the most dangerous. Used in electrochemical processes and in various fungicides, they are often discharged into the environment and passed into water. They accumulate as they pass through the food chain, and have teratogenic properties. Herbicide effects are more equivocal; toxic effects of 2,4,5-T are more often attributed to dioxin, a nondegradable product. Bird gonads are strongly affected by 2,4-D. All of these products seem to accumulate in the bird ovaries, pass on to the egg yolk, and then affect the embryo. In mammals, the placenta does not completely protect embryonic development from effects of the pesticides. Certain products do not seem to affect the fetus, but effects may manifest themselves in the adult organisms. Adverse effects may not be manifest in treated eggs, but the hatching of eggs laid by the treated generation may be impaired.

76-1492. Boulekbache, H.; Spiess, C. (Lab. Anat. Comp., Univ. Paris VII, Paris, France). **Effets du lindane sur les alevins de truite (*Salmo irideus* Gibb.). Perturbations de certaines enzymes glycolytiques. [Effect of lindane on trout fry (*Salmo irideus* Gibb.). Changes in glycolytic enzymes.** *Bull. Soc. Zool. Fr.* 99(1): 79-85; 1974. (17 references) (French)

Trout fry were systematically treated with lindane (dissolved in acetone and diluted in water at 0.11 and 5 ppm) from hatching to yolk-sac resorption. Histological effects centered on the liver and the muscles; the liver had a compact appearance due to crowding of the hepatocytes, and the number of kineses seemed to decrease. In the muscles, the myofibrils were retracted, the sarcolemma and sarcoplasma were ragged, and the glycogen was diffuse and less abundant. Enzyme comprised a 40% decrease in LDH activity in the liver and muscle (3% in the brain, 7% in the eyes, and 30% in the gills). Aldolase

activity decreased 3.3% in the muscle and 7% in the liver. Phosphoglutamase seemed to be stimulated by lindane in the muscle (32% increase) although its activity decreased by 17% in the liver. Pyruvate kinase decreased by 34% in the muscle and hardly changed in the liver, where its activity is minimal. The histological and physiological manifestations of lindane intoxication resulted in retardation of growth, as expressed by a 2-3 mm decrease in the size of the fry and by delays in morphogenesis and in resorption of the yolk sac. The irregular distribution of glycogen in muscle and liver suggests interference with carbohydrate metabolism by glycolysis. The changes in enzyme activity could be related to stimulation of glyconeogenesis.

76-1493. David, D. (Lab. Biol. Anim., Univ. Clermont, Aubiere, France). **Modifications ultrastructurales induites par le DDT au niveau de la cellule hepatique d'embryon d'oiseau. [Ultrastructural modifications induced by DDT in the hepatic cells of chick embryos.]** *Bull. Soc. Zool. Fr.* 99(1): 87-91; 1974. (5 references) (French)

Chicken eggs were soaked for 30 seconds in an aqueous solution of commercial DDT (50% active ingredient; 2,3, or 5 g/liter of water) before incubation. The hepatic cells of the embryos showed nuclear and cytoplasmic ultrastructural anomalies. The pesticide produces swelling of the liver cell nucleus and a decrease in the size of the nucleolus. In certain cases, the nucleolar structure is altered: partial segregation of its three components or a ring-like nucleolus. In the nucleoplasm, lipid deposits and nuclear degeneration are seen. Cytoplasmic organelles are also affected; the mitochondria display scarcity of cristae, hypertrophy, and frequently interrupted internal membranes. The smooth endoplasmic reticulum is more abundant than in controls; the ergastoplasmic saccules, swollen and short, have reduced numbers and irregular spacing of ribosomes. The Golgi apparatus is vacuolar. The glycogen content is reduced, and lipids and lysosomal inclusions are more numerous. This fulminant reaction to DDT can sometimes lead to partial necrosis of the liver of the chick and quail embryo.

76-1494. Didier, R. (Lab. Biol. Anim., Univ. Clermont, Aubiere, France). **Action du 2,4,5-T et de la simazine sur les gonades de l'embryon de poulet et de caille en culture in vitro. [The action of 2,4,5-T and simazine on the gonads of chick and quail embryos in in vitro cultures.]** *Bull. Soc. Zool. Fr.* 99(1): 93-99; 1974. (9 references) (French)

Embryo gonads from male and female chick and quail embryos were explanted after 9 days of incubation onto a medium containing 1-2% 2,4,5-T or simazine. After 5 days, the male chick gonads have an undifferentiated appearance and are sterile, or have reduced fertility due to the involution of the gonocytes; the ovary, however, reacts with a more or less complete loss of cortex. In the quail embryos, the pesticides destroy the germinal material of the testes, which take on a vacuolated appearance; the cortex of the ovaries is present, but the gonocytes in meiotic prophase degenerate. Histochemical examinations indicate that the activity of Δ 5-3 β-hydroxysteroid dehydrogenase (Δ5-3β HSDH) becomes completely undetectable in the testes, but remains normal in the female explants.

76-1495. Jeanne-Levain, N. (Lab. Physiol. Cellulaire Vegetale, Univ. Paris VII, Paris, France). **Etudes des effets du lindane sur la croissance et le developpement de quelques organismes unicellulaires. [Effects of lindane on the growth and development of a few unicellular organisms.]** *Bull. Soc. Zool. Fr.* 99(1): 105-109; 1974. (6 references) (French)

The dinoflagellate *Amphidinum carteri* is very sensitive to lindane: lethal dose 2 μg/ml. *Euglena gracilis* is quite resistant; high doses of lindane (50-60 μg/ml) only produce a temporary slowing of growth. In cultures of *Tetrahymena pyriformis* and *Dunaliella bioculata*, the growth rate decreases at 5 μg/ml, and inhibition of cell division is total at 10 μg/ml. In both species, cellular multiplication rapidly resumes when the cells are washed and placed in clean medium. In *Tetrahymena*, however, the cells die after 3 days of treatment if they are not transferred to a new medium. The rapid toxic effects of lindane on *A. carteri* do not produce notable morphological modifications. In *E. gracilis*, at the beginning of experimental intoxication at high doses, partial decolorization and a decrease in motility are observed. In *Tetrahymena* cultures with 10 μg of lindane, a net slowing of movement, progressive disappearance of the digestive vacuoles, and a decrease in the size of the cells are observed. In a normal medium, the effects are reversed, and although abnormal forms sometimes appear, they seem to degenerate quickly. Significant morphological changes take place in *Dunaliella bioculata*. They lose their flagellae, they fall to the bottom of the culture medium, their size increases, and internal organelles begin to multiply. Upon return to a normal environment motility and activity resume; a number of organisms have numerous flagellae either situated in one spot or distributed in many areas.

76-1496. Roux, F.; Hebert, S.; Fournier, E. (Unite de Toxicol. Exper., Fernand Widal Hosp., Paris, France). **Modifications de la zone de Golgi et du systeme lysosomial dans les hepatocytes en culture sous l'effet des pesticides organo-chlores. [The effects organochlorine pesticides on the Golgi complex and the lysosomal system in liver cell culture.]** *Bull. Soc. Zool. Fr.* 99(1): 125-148; 1974. (17 references) (French)

Liver cell cultures were exposed for 72 hours to 10-60 ppm of *p,p'*-DDT, dieldrin, and lindane solubilized with dimethyl sulfoxide (0.2%). Low concentrations (around 30 ppm) of insecticides capable of inducing hyperplasia or hypertrophy of the liver cells—responses which in themselves are not proof of toxicity—produced the same cellular alterations observed in liver cells treated with doses inhibitory to growth: increased numbers of

lysosomal granules in the cytoplasm, disappearance of acid phosphatase activity from the Golgi apparatus, and appearance of very large vacuoles in the cytoplasm, accompanied by acid phosphatase activity in a few vacuoles. The increase of lysosomal granules could be an indication of an autophagic process as a means of defense. The disappearance of Golgi apparatus acid phosphatase activity can be explained by the migration of the hydrolytic enzyme into the autophagic structures. The appearance of enormous vacuoles is not easily explained; ionic alterations in the cell could be induced by ethionine, and the vacuolar modifications observed would then be a result of ion and water accumulation.

76-1497. Lutz-Ostertag, Y.; David, D. (Lab. Biol. Anim., Univ. Clermont, Aubiere, France). **Preuves expérimentales de l'action du DDT sur le maintien des canaux de Muller de l'embryon male oiseau. [Experimental proofs of DDT action on the persistence of bird embryonic male muellerian ducts.]** *Bull. Soc. Zool. Fr.* 99(4): 731-741; 1974. (26 references) (French)

Commercial DDT, containing 50% active ingredient and used at a 5% concentration, was added to a culture medium where it prevented the involution of male bird embryos' muellerian ducts, extracted in vitro on day 9 of incubation. Various embryonic organs, such as testes, brain, muscles, skin, and feathers, from eggs treated with DDT before incubation will not interfere with persistence of the muellerian ducts incubated with them in vitro. In the presence of untreated organs and tissues, however, the ducts generally regress for the most part. DDT thus exerts effects resembling those of estrogens. When the ducts are incubated in a DDT-containing culture medium, the pesticide acts directly on the ducts by inactivating the proteolytic enzyme responsible for regression. Since DDT contained in various organs and tissues is capable of preventing involution of the ducts, it seems that a disturbance of the hormonal function of the gonads is not solely responsible for this effect. Instead, the DDT retained in the embryonic tissues probably acts directly. These DDT residues diffuse from the donor organ to the muellerian ducts, where they cause inactivation of proteolytic enzyme in vitro.

76-1498. Miayoukou, J. F.; Albertini, L. (Lab. Cytol., Ecole Natl. Sci. Agron., Toulouse, France). **Etude de l'action cytotoxique exercee par le silicate de methoxyethylmercure au niveau radiculaire chez le *Triticum durum* Desf. [Study of cytotoxic action of methoxyethylmercury silicate on the roots of *Triticum durum* Desf.]** *C. R. Hebd. Seances Acad. Sci. Ser. D* 81(17): 1227-1230; 1975. (5 references) (French)

Methoxyethylmercury silicate (SMEHg) has mitoclasic effects and inhibits cytodieresis in *Triticum durum* Desf. at low concentrations (1.0 μM/liter); symptoms are cessation of mitoses at metaphase and dispersed and slightly thickened metaphasic chromosomes. At higher concentrations (0.1 μM/liter), it has mitostatic and chromosome-damaging effects characterized by intense pycnosis and fragmentation of the chromatin. Cysteine and thioglycolic acid at 1.0 mM/liter can eliminate toxic effects on roots treated with the fungicide; however, they are incapable of reversing the growth inhibition caused by $HgCl_2$.

76-1499. Schom, C. B.; Abbott, U. K. (Dep. Biol., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Teratogenic response of two avian species to an organophosphorus insecticide Azodrin.** *Can. J. Genet. Cytol.* 17(3): 465-466; 1975.

The effects of azodrin (monocrotophos) were studied on embryos from chicken and bobwhite quail. The embryos were treated on or before the third day of incubation by yolk injection. Azodrin was given as 0.1 mg alone or with 0.1 mg nicotinamide in 0.05 ml saline carrier to 223 chicken embryos, and in 0.25 ml saline to 45 bobwhite quail embryos. Chicken embryos responded with micromelia to azodrin while the bobwhite quail embryos gave amuscular responses. However, no response was noted until the third day of incubation for the chicken and until the sixth day for the bobwhite quail. This was at about Hamburger and Hamilton stage 20 for each species. Azodrin reduced the enzyme activity even when given in conjunction with nicotinamide. The acetylcholinesterase activity of chicken embryos treated with both drugs was slightly lower than when they were treated with azodrin alone. The bobwhite quail activity of acetylcholinesterase was a little higher when treated with both chemicals than when treated with azodrin alone. Although esterase activity cannot explain the chicken deformities, it may explain the bobwhite quail amuscular development.

76-1500. Schom, C. B.; Abbott, U. K. (Dep. Biol., Dalhousie Univ., Halifax, Nova Scotia, Canada). **Quantitative genetic response of chicken embryos to organophosphorus insecticide azodrin.** *Can. J. Genet. Cytol.* 17(3): 466; 1975.

The effects of azodrin (monocrotophos) were studied on chicken embryos. An Australorp flock, pedigreed and closed for at least 30 generations, provided the fertile eggs. A total of 789 embryos were treated in 10 trials. Azodrin was given at 0.025 mg in 0.05 ml or 0.9% saline. In order to quantitate the teratogenic response, each abnormality was scored. If absent, the score was zero, and the score was 1 if present. However, parrot beak was scored 1 or 2 depending on the severity. No significant correlation was noted between egg size and teratogenic response. However, the abnormalities all showed genetic correlations and heritabilities. The heritability was as follows: parrot beak 0.83, hyperlordosis 0.20, and micromelia 0.73. The day of death had a low heritability, 0.07, with no measurable genetic, environmental, or phenotypic correlation with teratogenesis.

76-1501. Alam, M. T.; Kasatiya, S. S. (Dir. Gen. Lab., Minister Social Affairs Quebec, Ville de Laval, Quebec, Canada). **Chromosome damage induced by an organic phosphate pesticide in human cells.** *Can. J. Genet. Cytol.* 17(3): 544; 1975.

The effects of in vitro treatment of guthion (azinphosethyl) were studied on human cells. Two cell lines, diploid (Wi-38) and hyperdiploid (HEp-2), were used in the study. Dosages of 120, 140, and 160 μg/ml of guthion were effective in inducing average chromosome breakage rates of 0.040, 0.058, and 0.181 respectively/cell of Wi-38 cells. The mean number of breaks/cell for controls was 0.011. Thus chromosome breakage was significantly higher in treated cells. A high incidence of chromosome aberrations was also noted in treated HEp-2 cells. The most common were chromatid breaks and exchanges. Mild failure of condensation, despiralization, secondary constrictions, gaps, dicentric chromosomes, and pulverization were infrequently noted. This study reaffirms previous findings of the potentially hazardous mutagenic effects of guthion.

76-1502. Kalac, J. (Dep. Hyg., Inst. Anal. Drug Pharm., Bratislava, Czechoslovakia). **Ucinky organofosforovych zlucenin na aktivitu niektorych enzymov zazivacieho. [The effect of organophosphorus compounds on the activity of some digestive enzymes.]** *Cesk. Hyg.* 19(8): 355-362; 1974. (28 references)

The effects of organophosphorus compounds on the activity of some digestive enzymes were studied in two species of Atlantic fish: herring (*Clupea harengus* L.) and capelin (*Mallotus villosus* L.). The pyloric ceca proteinases were isolated and partly purified. The study showed that *Clupea harengus* proteinases consisted of 6 enzymatically active fractions. Four of these fractions possessed specific activity of trypsin and two possessed chymotrypsin activity. Capelin pyloric ceca proteinases consisted of three enzymatically active fractions, two of which belong to trypsin and the third possessed chymotrypsin activity. On addition of organophosphorus pesticides to the water, the proteolytic activity of the fish was partly inhibited. Parathion, metathion (fenitrothion), and malathion in concentrations of 8.8 n*M* up to 2.0 μ*M* predominantly caused inhibition of trypsin activity. In considering individual isozymes of trypsin, the most sensitive to the action of organophosphorus compounds was trypsin fraction "4". A correlation was found between the inhibitory effect of a pesticide and its toxicity.

76-1503. Sonntag, A. C. (Dep. Obstet.-Gynecol., Univ. New Mexico, Albuquerque, NM). **Xenobiotics and molecular teratology.** *Clin. Obstet. Gynecol.* 18(4): 199-207; 1975. (21 references)

The disturbance is reviewed of fetal and perinatal regulatory mechanisms due to exposure to PCBs and DDT. The environmental sources of PCB are generally agricultural chemicals or industrial accidents. Chicks fed a diet containing 0.01 ppm TCDD (dioxin) showed an increased mortality of 83%. Studies concerned with the toxicity of PCBs are made difficult by the chemical diversity of these compounds and the fact that it is hard to obtain pure samples. PCB-contaminated feed caused the death of 400,000 chickens in Japan in 1968. Transplacental passage of PCBs was proved in an epidemic of human poisoning resulting from contamination of rice bran oil with PCB. Severe atrophy developed in guinea pigs given s.c. doses of TCDD. Rats given 25 μg/kg TCDD demonstrated suppressed cell-mediated immunity. Monkeys developed atrophy of the lymph nodes, spleen, and hematopoietic tissues. An increased susceptibility to fungal and viral infections was noted among ducks and mammals exposed to TCDD and other PCB derivatives. Long term effects of in utero exposure to PCBs remain to be determined. A delay in ovulation as well as a decrease in eggshell thickness was produced by concentrations of DDT as low as 20 ppm in the diet of peregrine falcons. About 20% of the DDT used worldwide is composed of *o,p'*-DDT. Administration of technical grade DDT to adult rats had no effect on the reproductive function of the animals. However, 1 mg of *o,p'*-DDT given to neonatal rats produced persistent estrus with long-term vaginal cornification, large polycystic ovaries, and a decrease in the number of corpora lutea produced. Undoubtedly these effects were due to an upset in the developing regulatory mechanisms as no *o,p'*-DDT was found in any animal tissues at the conclusion of the experimental studies. Feeding of technical grade DDT, containing 17-20% *o,p'*-DDT, produced marked decreases in aggression and fighting behavior in male mice. Eggshell thinning was not the only result of exposure of birds to DDT. The exposed birds also demonstrated late breeding, decreased clutch size, and failure to lay. Ringdoves fed 10 ppm DDT for 3 weeks experienced a 30-40% decrease in blood estradiol level with a 200% increase in hepatic metabolism of estradiol. A 93% inhibition of uterine growth rate was noted in response to estrone administration in ovariectomized rats given chlordane to stimulate the mixed-function oxidase system. Workers in DDT plants had markedly altered metabolism of phenylbutazone and a 57% increase in the excretion of 6-β-hydroxycortisol. As there is ample evidence of molecular teratology at work in experimental animals and within the environment, it seems appropriate to study more fully, at the molecular level, the basic regulatory mechanism affecting humans.

76-1504. Kay, K. (Mount Sinai Sch. Med., New York, NY). **Conference on toxicology-epidemiology-health effects of pesticides. A review of the problem.** *Clin. Toxicol.* 8(3): 289-300; 1975. (60 references)

Six developments occurring in 1974 related to pesticides are reviewed: the vinyl chloride case; the regulation of 14 carcinogens under OSHA; the banning of aldrin and dieldrin; cancer among U.S. arsenic workers; the relation of neurotoxicity and carcinogenicity; human poisoning due to chlorinated-*p*-dioxins; and the encapsulation of pesticides. The findings of cases of hemangiosarcoma of the

liver among workers in polyvinyl chloride demonstrated that there is a need to retest older pesticides and associated materials that have never been adequately assessed on a long-term basis to disclose carcinogenicity. Of the 14 carcinogenic chemicals brought under control on Feb. 11, 1974 by the OSHA, only two, β-propiolactone and ethyleneimine, could be considered pesticidal. They constitute a potential occupational hazard for an extremely small percentage of workers exposed to pesticides. In 1974 dieldrin and aldrin were established as carcinogens. Large numbers of workers have been exposed to occupational contact with these carcinogens before. Hemangioendothelioma of the liver was diagnosed in vineyard workers. Last year leukemia was reported in a U.S. worker using arsenic pesticides. Studies of workers manufacturing arsenical sheep dip have strongly suggested that lung cancer occurs in higher than expected rates in these arsenic exposure occupations. Pesticides as a class of compounds appears to strengthen the idea of a relation between neurotoxicity and carcinogenicity. For a time, toxicologic test procedures were not adequately modified to avoid marketing products which contained high toxicity contaminants. A technique has been developed for the microencapsulating of pesticides to provide slow controlled release. Two years of field trials are cited during which the encapsulated methyl parathion diffusing through the pores of the polyamide microspheres maintained levels on crops for much longer than did conventional methyl parathion treatment. Residues of the encapsulating polyamide are inert and nontoxic in certain food crops. Microcapsules can be readily sprayed on as a water slurry. Caution is advised as the vinyl chloride case has alerted the health-related professions to the occurrence of unreated monomers and additives in seemingly nonreactive plastics. Even smaller nylon type polymer spheres are available. These could be inspired into the periphery of the lung where release of unreacted monomers and additives would presumably ensue.

76-1505. Hansen, L. G.; Metcalf, R. L.* ; Kapoor, I. P. (Sch. Life Sci., Univ. Illinois, Urbana-Champaign, IL 61801). **Biochemistry of selective toxicity and biodegradability-II. Comparative in vivo and microsomal *O*-dealkylation by mice and flies.** *Comp. Gen. Pharmacol.* 5(2): 157-163; 1974. (16 references)

A study was made of the comparative metabolism of *p*-nitrophenyl alkyl ether *O*-dealkylation in male and female mice and flies. The compounds studied were administered p.o. to mice in 100 μl olive oil and topically to flies in 1 μl acetone. The results of the study indicated that houseflies can remove the methyl group more readily than the ethyl group from *p*-nitrophenyl ethers, and mice are able to *O*-dealkylate *p*-nitrophenetole better than *p*-nitroanisole. The longer chain ethers (*n*-propyl and *n*-butyl) are relatively poor substrates. The major product is *p*-nitrophenol. There was no evidence in this study for reduced glutathione-dependent *O*-demethylation of *p*-nitrophenetole or methoxychlor by microsomal or microsomal-supernatant preparations. Mouse liver microsomes were more active toward *p*-nitrophenetole than *p*-nitroanisole, while the reverse was true for housefly abdomen microsomes. The in vitro results with DDT analogues (methoxychlor and ethoxychlor) indicate considerably lower metabolism rates than with *p*-nitrophenyl ethers. Mouse liver microsomes not only had a greater capacity for *O*-dealkylation, but also converted more of the primary product to dihydroxy and polar metabolites. Thus both in vivo and in vitro data demonstrate that mice can remove the ethyl group from *p*-nitrophenyl alkyl ethers most readily. The pattern for methyl, ethyl, *n*-propyl and *n*-butyl ethers is similar to that found in rats, snails, and fish. Houseflies, however, are more efficient in *O*-demethylation, and activity decreases as chain length increases. This study serves to emphasize that biochemical differences among the various species cause differences in relative rates of metabolism of an analogous series of compounds.

76-1506. Rosic, N.; Lomax, P.; Kovacevic, N. (Inst. Biochem., Fac. Med., Univ. Belgrade, Belgrade, Yugoslavia). **The toxic and behavioural effects of a cholinesterase inhibitor in fish (*Serranus scriba*).** *Comp. Gen. Pharmacol.* 5(2): 187-189; 1974. (8 references)

The effect was studied of a potent organophosphorus cholinesterase inhibitor, *O*-ethyl-*O*- (4-nitrophenyl)-ethyl phosphonate (armine), on gross behavior and on established active avoidance responses in the fish *Serranus scriba*. Following the administration of armine in doses ranging from 80 to 250 μg/kg, s.c., all animals showed gross behavioral changes the severity of which was dose dependent. The first sign was a decrease in spontaneous motor activity appearing 1 to 2 hr after injection. Loss of balance and characteristic rolling movements often preceded the toxic signs. Fish would then remain motionless for prolonged periods. After doses of 100 μg/kg or more, marked respiratory difficulties were noted and after 2-3 hr convulsions occurred. Death usually followed convulsions. The calculated median lethal dose was 120 μg/kg. In behavioral experiments, trained fish were treated with armine (60 μg/kg, s.c.). This dose caused no overt behavioral signs or toxicological disturbances which would interfere with the animals' active avoidance reactions. The injection of this dose of armine caused a decrease in active avoidance responses. The maximum depression was noted 2 hr after treatment. After that time performance gradually recovered and 24 hr after drug administration the control level had been regained. This dose of armine depressed brain cholinesterase activity to only 80% of control levels. Enzyme activity returned to near normal levels within 4 hr. Although the evidence is not conclusive, the data suggests a direct causal relation between the time course of the behavioral deficit and enzyme depression.

76-1507. Elmamlouk, T. H.; Giessner, T. (Dep. Biochem. Pharmacol., State Univ. New York, Buffalo, NY 14214). **Species difference in metabolism of parathion: apparent inability of hepatopancreas fractions to produce**

paraoxon. *Comp. Biochem. Physiol.* 53C(1): 19-24; 1976. (29 references)

Good quality mitochondrial and microsomal fractions of lobster heptopancreas were prepared in lobster isotonic sucrose (0.84*M*) at 8700 g and 105,000 g by differential centrifugation. The microsomal fraction did not exhibit detectable mixed function oxidase activity with respect to parathion as the substrate. No conversion to paraoxon or *p*-nitrophenol was detected in incubations of hepatopancreas subcellular fractions or homogenates, fortified with NADPH, NADH, FAD or FMN, singly or in combination. By contrast, mouse liver microsomal incubations metabolized parathion to paraoxon and *p*-nitrophenol; moreover, these biotransformations were enhanced 1.5-2.0-fold when microsomal preparations from phenobarbital pretreated mice were used. (Author abstract by permission)

76-1508. Colliot, F. (Author address not given). **Qu'est-ce que le Chlormephos? [What is chlormephos?]** *Def. Veg.* 167(28): 154-163,166-171; 1974. (3 references) (French)

Chlormephos is an effective replacement for chlorinated cyclodienes. The effective dose ranges between 40 and 80 kg/ha of granules, either 2-4 kg a.i./ha (on the basis of a full surface treatment), or 0.3-0.6 kg a.i./ha locally on the planted bed (according to the cultures, the size of the treated area etc.). Acute toxicity for the rat consists of an oral LD50 of 12 mg/kg and a percutaneous LD50 of 27 mg/kg. Semi-chronic toxicity for the rat is characterized by a maximum daily dose of 0.39 mg/kg. A daily dose of 50 ppm in the food of a dog did not lead to death or toxicity symptoms after 3 months. Toxicities for various animals are oral LD50, 130 mg/kg for hens; 3.8 mg per liter of air for the rat (inhalation); and 6300 mg/kg for the male rat in cases of cutaneous toxicity from granulates at 5%. Chlormephos does not irritate the eyes. Antidotes include PAM (pralidoxime) or, preferably, a combination of PAM and atropine sulfate. In the form of granules, chlormephos presents fewer risks of intoxication.

76-1509. Bagaev, V. B.; Abueva, A. A. (Author address not given). **Vliyanie usloviy pitaniya na protsessy detoksikatsii gerbitsida 2,4-D v rasteniyakh l'na-dolguntsa. [Effect of nutrition conditions on detoxication of the herbicide 2,4-D in fiber-flex plants.]** *Dokl. TSKHA (Timiryazev. Sel'skokhoz. Akad.)* 193: 41-45; 1973. (8 references) (Russian)

The uptake and detoxication of 2,4-D (sodium salt) by fiber-flax plants grown in soils with different levels of nitrogen, phosphorus, and potassium fertilization was studied by vacuum infiltration of 0.024, 0.076, and 0.24% solutions of 2,4-D. The herbicide uptake was highest in plants grown under the conditions of intense and complete mineral fertilization. The detoxication of 2,4-D in the plants was due mainly to its conjugation with cellular proteins. Over 60% of the herbicide was found in the alkaline extract of the cellular proteins in plants grown without fertilization or with partial fertilization, while the alkaline extract contained 72-77% of the herbicide in the case of plants grown in soils with high nitrogen, phosphorus, and potassium contents.

76-1510. Chasseaud, L. F. (Dep. Metabolic Studies, Huntingdon Res. Cent., Huntingdon, England). **The nature and distribution of enzymes catalyzing the conjugation of glutathione with foreign compounds.** *Drug Metab. Rev.* 2: 185-220; 1973. (251 references)

Glutathione (GSH) *S*-transferases appear to have two main roles: the conjugation of potentially harmful electrophiles with the endogenous nucleophile, GSH, thereby protecting other nucleophilic centers in the cell; and the provision of a means of excretion for these electrophiles. The most extensively studied of the GSH *S*-transferases has been GSH *S*-aryltransferase, the reactions catalyzed by which are analogous to nucleophilic aromatic substitutions. Among the substrates which have been used to assay for the activity of this enzyme are halonitrobenzenes, aryl nitro compounds, sulfobromophthalein, and *S*-triazines. Alkyl halides, allyl halides, halogenocycloalkenes, allyl methane sulfonates, and organophosphates have been used to study the substrate specificity of the GSH *S*-alkyltransferase system, and arylhydrocarbon epoxides, arylhalide epoxides, and other epoxide precursors have been used to study the GSH *S*-epoxidetransferase system. The GSH *S*-aralkyltransferase system, the GSH *S*-alkenetransferase system, and glutathione *S*-estrogentransferase are also discussed, as are other mercapturic acid precursors, other related GSH-dependent enzyme systems, the criteria defining possible mercapturic acid biosynthesis, and the distribution and nature of GSH *S*-transferases.

76-1511. Watson, A. P.; Van Hook, R. I.; Reichle, D. E. (Environ. Sci. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830). **Toxicity of organic and inorganic arsenicals to an insect herbivore.** *Environ. Sci. Technol.* 10(4): 56-359; 1974. (22 references)

Four arsenicals including organic and inorganic forms of both the trivalent and pentavalent states were tested for their potential environmental effect on a nontarget animal species. Cacodylic acid, cacodylic acid plus sodium cacodylate, arsenic trioxide, and arsenic pentoxide were evaluated in terms of formulation, exposure time, and tissue arsenic concentrations on the survival of an exposed population of meadow katydids. Tissue concentrations of elemental arsenic were higher for organic forms than for inorganic forms at similar exposure dosages. Life expectancies were reduced to $< 10\%$ of unexposed populations by levels above 5 μg As/g dry weight in dosing formulations. While As concentrations in katydid tissues did not exceed those in the dosing formulations, they did exceed tissue concentrations found in unexposed populations by as much as three orders of magnitude. These results illustrate the impact of herbicidal arsenic formulations on a nontarget animal species. (Author abstract reprinted by permission of the American Chemical Society)

76-1512. Bernadou, J.; Quan, D. Q. (Lab. Pharm. Chim., Fac. Sci. Pharm., Univ. Paul Sabatier, 31 Toulouse, France). **α-Hydroxyiminocetones aliphatiques comme reactivateurs de cholinesterases de rat et humaines inhibees par divers organophosphates.** [**Aliphatic α-hydroxyiminoketones as reactivators of rat and human cholinesterases inhibited by several organophosphates.**] *Eur. J. Med. Chem. Chim. Ther.* 10(6): 599-601; 1975. (26 references) (French)

A group of 16 aliphatic α-hydroxyiminoketones, 5 of which are new compounds, were synthesized and biologically tested for their toxicity and reactivator ability against rat and human plasma and erythrocyte cholinesterases inhibited by diisopropylfluorophosphate (DFP). It was found that their toxicity and reactivator ability depended mainly on the -C=NOH nucleophilic group and thus on the molecule p*K*a. A considerably higher action was shown by the α-ketoaldoximes than by the α-ketoketoximes. The reactivator ability also depended on the carbon chain structure, which was related to a good steric complementarity between enzyme and reactivator. The reactivator ability of the oxime depended on the nature of the organophosphate inhibitor, diisopropylfluorophosphate, parathion, malathion, or phosphamidon.

76-1513. Giuran, V. (Chem. Cent., Timisoara, Romania). **Modificari ale structurii chimice a pesticidelor organofostforice in raport cu diferite conditii de mediu fizic, chimic sau biologic.** [**Modifications in the chemical structure of organophosphorus pesticides as related to various conditions of the physical, chemical, or biological environment.**] *Igiena* 22(8): 485-495; 1973. (21 references) (Romanian)

The primary factors in the chemical modifications of pesticides are named and briefly explained. Typical reactions of the radicals in either aliphatic or carbocyclic structures of organophosphorus compounds, the hydrolysis of parathion, and the metabolic pathways of dimethoate in plants and animals are schematically shown. Structural changes caused by metabolic factors are then reviewed and the chemical reactions shown. The in vivo enzymatic oxidation of the P=S radical into P=O radical increases the toxicity of parathion, while the oxidative *N*-dealkylation of dicrotophos increases the LD50 in the mouse from 14 to 3 mg/kg and *p*I50 in the common fly from 7.2 to 6.5. The *O*-dealkylation of dicrotophos, chlorfenvinphos, and methyl paraoxon results in relatively nontoxic metabolites. The hydrolysis of the carboxylesters by carboxylesterase and deamination by the action of amidase have an important function in the detoxification of malathion and dimethoate. The *p*I50 for insects, LD50 for beneficial insects and LD50 for mice are increased by metabolism of Schradan and Bidrin (dicrotophos). The reduction of parathion to aminoparathion decreases the LD50 for rats from 4 mg/kg to 450 mg/kg; the in vivo metabolism of formothion (LD for rats=375-535 mg/kg) to dimethoate (LD50 for rats, 215 mg/kg) increases the general toxicity. UV radiations induce photochemical decomposition of parathion and phorate. The action of temperature is exemplified by the isomerization of parathion to sulfethyl parathion.

76-1514. Kendall, M. W. (Dep. Anat., Sch. Med. Sci., Univ. Nevada, Reno, NV 89507). **Acute LM and EM histopathologic alterations induced in rat liver by the fire-ant poison mirex.** *Anat. Rec.* 184(3): 444; 1976.

The effects were studied of feeding mirex to Mai-Wistar rats. The rats were given 200 mg/kg mirex by stomach tube over a 12 day period. Light microscopy revealed cellular liposis in the periportal regions of the liver from these animals, but not in the central regions. Apparent glycogen depletion and hepatocyte enlargement were noted among the hepatic damage. Electron microscopy revealed increased smooth endoplasmic reticulum, atypical lysosomes, lipid accumulations, and liver cell enlargement. It is reasonable to expect the liver to show damage from mirex similar to that observed from the chlorinated polyhalogen carbon tetrachloride, also an hepatotoxin. This is especially true regarding the deposition of lipids in regular lobular zonation patterns due to intracellular damage inflicted by the respective polyhalogen. Lipid accumulation in periportal liver cells was caused by mirex, whereas carbon tetrachloride caused lipid accumulations in centrilobular liver cells. The atypical lysosomes noted in mirex-intoxicated rats were not found in rats exposed to DDT. This research indicates that it is necessary to investigate individual compounds rather than to rely on typical changes produced by a class of compounds as these changes may well vary among the members of the class.

76-1515. Mikhaleva, A. L.; Molodyuk, A. V.; Levina, V. Ya.; Andropova, S. N. (Moscow, USSR). **O vozrastnykh i polovykh razlichiyakh v reaktsiyakh organizma belykh krys na vvedenie tiotef i imifosa.** [**Age- and sex-specific differences in the reactions of rats to the introduction of thio-TEPA and imiphos.**] *Farmakol. Toksikol. (Moscow)* 37(4): 464-466; 1974. (12 references) (Russian)

Sex- and age-specific differences in the acute intraperitoneal toxicity and therapeutic effectiveness of thio-TEPA and imiphos were studied in young (2 months old), adult (10-12 months old), and old (20-22 months old) male and female white rats. The LD50 values of thio-TEPA were determined to be 12.1±13.3 mg/kg in young males and females, 8.5±10.1 mg/kg in adult males and females, and 10.0±11.0 mg/kg in old males and females. The LD50 of imiphos was 29.7±50.3 mg/kg in young males, 24.3±40.7 mg/kg in young females, 52.9±59.5 mg/kg in adult males, 18.7±33.3 mg/kg in adult females, 60.6±79.4 mg/kg in old males, and 24.3±40.7 mg/kg in old females. When administered repeatedly in doses close to the therapeutic ones, both thio-TEPA and imiphos produced weaker responses in young rats than they did in adult and old animals.

76-1516. Zakirov, U. B.; Kadyrov, U. Z.; Mirtursunova, S.; Gulyamov, T. (Author address not given). **Vliyanie tetrametiltiuramdisul'fida na vneshnesekretornuyu funktsiyu podzheludochnoy zhelezy. [The effect of tetramethylthiuram disulfide on the exocrine secretion of the pancreas.]** *Farmakol. Toksikol. (Moscow)* 39(1): 56-59; 1976. (4 references) (Russian)

The influence of different doses of tetramethylthiuram disulfide (thiram) was studied on the activity of amylase, lipase, and protease in the pancreatic homogenate and small intestine contents of white rats. Six hours after a single dose of 1/3 LD50, a 2 to 2.5-fold drop in enzymatic activity was noted in the chyme. Twenty-four hr later, it was inhibited in the glandular tissue as well. During the first months of a lengthy introduction of relatively small doses of the chemical (1/20 and 1/50 LD50), a depression of the exosecretory function of the pancreas was noted with subsequent restoration at the 4th and 6th months. Atropinization of the animals did not prevent the inhibitory action of the compound on the secretion of pancreatic enzymes. These results led to the conclusion that tetramethylthiuram disulfide either exerts a direct effect on the acinar cells or else disturbances of humoral mechanisms regulating the activity of the glands prevail.

76-1517. Pellerin, D.; Harouchi, A.; Soulier, Y. (Clin. Chir. Infant., Hop. Enfants Malades, 75730 Paris Cedex 15, France). **Les tumeurs de la cortico-surrenale de l'enfant. A propos de 10 cas. [Adrenocortical tumors in children. Ten cases.]** *Ann. Chir. Infant.* 16(3): 155-179; 1975. (32 references) (French)

The selection of treatment (largely based on prognosis) is made difficult by the histological uncertainties surrounding adrenocortical tumors. Three of the 10 cases presented received anti-adrenal chemotherapy with *o,p'*-DDD (TDE). One patient (5 years old) received *o,p'*-DDD treatment (8 g/d + 30 mg hydrocortisone) following a first relapse; death occurred 15 months later. In the case of the second patient (10 years old), the rate of tumor growth was not affected by *o,p'*-DDD (2 g, then 6 g/d), and death occurred 3 months later. In the case of the third patient (5.5 years old) however, *o,p'*-DDD administration (3 g/d) resulted in clinical, biological, and radiological remission which has apparently lasted 7 years. Usually, *o,p'*-DDD is utilized in "hopeless" cases where the tumor is inoperable, or where there are massive relapses or metastases; in addition, the toxicity of the product, although reversible, sometimes necessitates a shortening of the treatment and only permits its use in cases where the malignancy of the tumor is confirmed. However, earlier and prolonged utilization could improve results, as is suggested by the third case above. The efficacy of *o,p'*-DDD is undoubted; administered to 138 patients with adrenal carcinomas, it reduced hormone secretion in 69% and produced definite tumor regression in 34%. As part of a therapeutic scheme for adrenocortical tumors, *o,p'*-DDD should be used as a fundamental part of chemotherapy in cases of inoperable tumors, before and after surgery. In cases of operable malignant tumors, whether the malignancy is definite or only presumed, *o,p'*-DDD treatment should follow surgery. In cases of relapse, *o,p'*-DDD or Elipten should be used.

76-1518. Desoille, H.; Truffert, L.; Philbert, M.; Girard-Wallon, C.; Ripault, J. (Inst. Hyg. Indust. Med. Trav., Hotel-Dieu et Inst. Biomed. des Cordeliers, Paris, France). **Etude experimentale de la synergie lors de l'utilisation simultanee du piperonylbutoxyde et de certains hydrocarbures aliphatiques chlorofluores. [Experimental study of synergism. Application to the simultaneous utilization of piperonyl butoxide and some aliphatic chlorofluorocarbons.]** *Arch. Mal. Prof. Med. Trav. Secur. Soc.* 56(1-2): 5-18; 1975. (French)

To study the possibility of enhanced long range mortality, cellular toxicity, and carcinogenic activity due to simultaneous use of trichlorotrifluoroethane and piperonyl butoxide, 4 types of experiments were carried out. In the first type (3 experiments) 144 adult white rats received separate injections of the chlorofluorocarbon and piperonyl butoxide in tricapryline solutions, or of preparations containing both products in tricapryline solution. Results did not indicate that piperonyl butoxide in the presence of tricapryline alters the toxicity of trichlorotrifluoroethane, whatever the time lapse between injection and exposure to trichlorotrifluoroethane. In the second type of experiment, the animals (80 controls: 8 mothers, 72 offspring; and 86 exposed: 8 mothers, 78 offspring; plus 20 third generation offspring) were exposed by means of aerosol bombs. Results of anatomopathological examinations show no significant difference between the distribution of tumors in the controls and in the exposed group. It should be noted, however, that these studies have been carried out from the viewpoint of research related to the current conditions of utilization of these products rather than to the idea of some cancerologists that "the only possible safe exposure for man is no exposure." Furthermore, the complexity of the actual composition of one of these products, piperonyl butoxide, its possible variations in composition, and the possible content of various impurities requires strict analytical control of commercially distributed products, especially in the cases of aerosol sprays.

76-1519. Hook, J. B.; Cardona, R.; Osborn, J. L.; Bailie, M. D. (Dep. Pharmacol., Physiol., and Human Dev., Michigan State Univ., East Lansing, MI 48824). **The renal handling of 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) in the dog.** *Food Cosmet. Toxicol.* 14(1): 19-23; 1976. (8 references)

The herbicide 2,4,5-T is actively transported by renal cortical slices of dogs and rats, suggesting that the compound should be rapidly eliminated from the body via the kidneys. The prolonged plasma half-life of 2,4,5-T in the dog (77 hr) indicates that factors other than secretion

into the urine are important determinants of elimination in the dog. This study was designed to determine the renal handling of 2,4,5-T in anesthetized dogs, and an attempt was made to increase excretion of the herbicide with sodium acetate. Injection of 2,4,5-T decreased clearance of *p*-aminohippurate in a dose-dependent manner, suggesting that the compound was actively secreted. The clearance of the herbicide, however, was exceedingly low, being less than 1% of inulin clearance. The clearance of 2,4,5-T was increased by sodium acetate and by acetazolamide. Additional studies with mannitol, sodium bicarbonate, and ammonium chloride demonstrated that clearance of 2,4,5-T was related to urinary pH, but only when the pH exceeded 6, and was not affected by changes in urine volume. Addition of plasma inhibited the transport of 2,4,5-T by renal cortex in vitro, suggesting that the low clearance in vivo was due to very tight binding of the herbicide to plasma protein. (Author abstract by permission)

76-1520. Khera, K. S.; Villeneuve, D. C.; Terry, G.; Panopio, L.; Nash, L.; Trivett, G. (Food Directorate Res. Lab., Health and Welfare Can., Ottawa, Ontario, Canada). **Mirex: a teratogenicity, dominant lethal and tissue distribution study in rats.** *Food Cosmet. Toxicol.* 14(1): 25-29; 1976. (17 references)

The teratogenic potential of mirex was studied in rats given daily oral doses of 0, 1.5, 3.0, 6.0, and 12.5 mg/kg on days 6-15 of gestation. The 12.5-mg/kg dosage caused maternal toxicity, pregnancy failure, decreased fetal survival, reduced fetal weight, and an increased incidence of visceral anomalies. Maternal effects and an increased fetal incidence of (visceral) anomalies were observed also with the 6-mg/kg doses. Lower doses produced minimal or no adverse effects. Mirex accumulated in the maternal tissues and readily crossed the placenta. Although mirex was present in the testes of treated adult rats, a dominant lethal assay revealed no significant difference in reproduction parameters between controls and the groups treated with 1.5, 3.0 or 6.0 mg/kg. (Author abstract by permission)

76-1521. Van Miller, J. P.; Marlar, R. J.; Allen, J. R. (Dep. Pathol., Univ. Wisconsin Med. Sch., Univ. Wisconsin, Madison, WI 53706). **Tissue distribution and excretion of tritiated tetrachlorodibenzo-*p*-dioxin in non-human primates and rats.** *Food Cosmet. Toxicol.* 14(1): 31-34; 1976. (22 references)

Tritiated 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) was given to adult and infant rhesus monkeys and to rats to determine the distribution of this compound and to compare the tissue localization of the compound in the two species. Excretion, both daily and total, was similar in all three groups of animals, as was total tritium recovery. However, the concentration and total level of tritium in most tissues differed significantly between species. In the rat, retention in the liver accounted for over 40% of the administered dose, while this level was less than 10% in the livers of the monkeys. In contrast, a large percentage of the dose was located in the monkey in tissues with a high lipid content, particularly the skin, muscle and fat. In the rat, these tissues had much lower levels of TCDD. (Author abstract by permission)

76-1522. Uga, S.; Ishikawa, S.; Mukuno, K. (Sch. Ophthalmol., Fac. Med., Kitasato Univ., Sagamihara, Kanagawa, Japan). [**Ultramicrostructural changes in the retina of dogs administered organophosphorus pesticides for extended time periods.**] *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 70(3): 282-283; 1976. (5 references) (Japanese)

Results are presented of electron microscopic examinations of beagle retina after administration of 0.5-1.5 mg ethylthiometon (disulfoton)/kg/day for 2 yr. Degeneration of the retina was observed predominantly in the layer of pigmented epithelial cells and consisted mainly of intracellular myelin-like structures, vacuolation in the cytoplasm,and formation of many dense bodies in the outer cytoplasm of Mueller cells in the retinal periphery. Conspicuous atrophy (decrease of medullated nerve fibers and thickening of the fiber bundle septum of the optic nerve) was observed in every intoxicated dog; however, instances in which the changes progressed from the optic nerve to the retinal ganglion cells (the cell body and the axons) were very rare.

76-1523. Andryushchenko, V. V.; Polikarpov, G. G. (Inst. South Seas Biol., of the Ukrainian SSR Acad. of Sci., Sevastopol', USSR). **Eksperimental'noe izuchenie nakopleniya *Ulva rigida* (Ag). Zn^{65} i DDT pri kombinirovannom zagryazneii imi morskoy vody.** [**Accumulation by *Ulva rigida* of zinc-65 and DDT simultaneously present in sea water.**] *Gidrobiol. Zh.* 10(4): 56-62; 1974. (17 references) (Russian)

The accumulation of ^{14}C-labeled DDT and of Zn^{65} was studied in *Ulva rigida* in sea water. The cumulation factor determined for DDT was highest when it was introduced freshly into the water, in the absence of Zn. The cumulation factor was considerably and significantly lower for DDT that had been kept in the water for 7 days (aged), and in the presence of Zn. This is due to the reduction of the amount of DDT available to the algae as a result of its combination with organic and inorganic particulates present in sea water, and possibly to its metabolism to DDD and DDE. Probably for the same reason, the cumulation factor for Zn was also higher in the absence of DDT.

76-1524. Spynu, E. I.; Sova, R. E.; Bolotnyy, A. V. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers and Plastic Materials, Kiev, USSR). **O kompleksnom deystvii fosfororganicheskikh pestitsidov.** [**Complex action of phosphororganic pesticides.**] *Gig. Sanit.* 40(12): 15-17; 1975. (7 references) (Russian)

The combined effects of metaphos (methyl parath-

ion), cidial (phenthoate), and dimethoate on cholinesterase activity was szudied in male and female white rats as a function of the mode and route of administration (in water, in oil, or percutaneously), taking 1/10 of LD50 as 100% of the total daily dose. Measurements of the cholinesterase inhibition revealed that the effect of the preparations was essentially the same when administered orally in aqueous suspension as in oil suspension, and the highest rate of cholinesterase inhibition was seen following percutaneous administration of the pesticides. The cholinesterase-inhibiting effect was highest when the given pesticide was simultaneously administered percutaneously and orally in water or oil.

76-1525. Shtabskiy, B. M. (Lvov Med. Inst., Lvov, USSR). **Kumulyativnye svoystva i gonadtoksicheskoe deystvie khimicheskikh veshchestv. [Cumulative properties and gonadotoxic effects of chemical substances.]** *Gig. Sanit.* 41(1): 82-84; 1976. (7 references) (Russian)

A relative method is described for the study of the gonadotoxic and cumulative properties of chemical substances. The method is based on the use of 4 pairs of reference substances with decreasing cumulative properties, with each pair including one substance with proven selective gonadotoxic action, and another without this property. To determine the possible specific gonadotoxic action of a given substance, its action should be compared with the nonspecific action of a reference substance having the same cumulative property. An equal or lower gonadotoxic effect indicates the absence of selectivity, and a stronger gonadotoxic effect indicates selectivity. It is impossible to assess the gonadotoxic effect of chemical substances without a knowledge of their cumulative properties. Comparative tests on adult male albino rats revealed a reduction of the cumulative properties in the order prometryne, dicotex and trichloropropionitrile. Experiments with daily 1/20 LD50 doses of these substances for 5-20 consecutive days revealed no gonadotoxic action of trichloropropionitrile, while dicotex, and especially prometryne, were definitely gonadotoxic, as judged from the cytological alterations in the seminiferous tubules.

76-1526. Khovaeva, L. A.; Shtenberg, A. I. (Lab. Pestic. Toxicol., Inst. of Nutr., USSR Acad. Med. Sci., Moscow, USSR). **Immunologicheskoe sostoyanie organizma pri vozdeystvii malykh doz khlorofosa i metilnitrofosa. [Immunological state of organisms influenced by low dosages of chlorophos and methyl nitrophos.]** *Gig. Sanit.* 41(1): 98-100; 1976. (4 references) (Russian)

Young male Wistar rats were given 1/100 LD50 doses of trichlorfon (7 mg/kg) and methylnitrophos (fenitrothion) (5 mg/kg) orally daily for 7.5 months in a study of these substances at low dosages. The immunological status of the rats was examined by inoculation with sheep erythrocytes twice at 5-day intervals after 2.5 months and 7.5 months of administration, and during a 3.5-month follow-up. In rats treated with trichlorfon, the hemagglutinin titer was stable throughout the experiment, with a significant reduction at 22 days after the end of the 7.5 month poisoning period. The hemolysin levels were increased by 17.6-14.2% at 2.5 and 7.5 months. The complement titer was at the control level, and the gammaglobulin level was slightly increased at 7.5 months. The acetylcholinesterase level was reduced by 25.9%. In animals treated with methylnitrophos, the hemolysin level, measured after prolonged fasting, was significantly lower than in the controls and in animals treated with trichlorfon. In contrast to the trichlorfon-treated animals, the hemagglutinin level was significantly reduced after immunization and fasting. The complement titer showed insignficant variations, and the gamma-globulin titer showed a rising trend by the end of the observation period. At 7.5 months, the acetylcholinesterase was reduced by 31.4%. The general health status of the animals was normal throughout the experiment. The findings indicate the influence of low doses of trichlorfon, and especially of methylnitrophos, on the immunological status of the organism.

76-1527. Preussmann, R. (Inst. Toxikol. Chemother., Dtsch. Krebsforschungszentr., Heidelberg, Germany). **Chemische Carcinogene in der menschlichen Umwelt. [Chemical carcinogens in the human environment.]** *Handb. Allg. Pathol.* 6: 421-594; 1975. (German)

The carcinogenic properties and the occurrence in the environment of polycyclic aromatic hydrocarbons, soot, *N*-nitroso compounds, natural carcinogens, inorganic carcinogens, pesticides, food additives, and drugs are reviewed. DDT induces benign hepatomas in susceptible mouse strains without being carcinogenic in other species, except for trout. Thus, DDT can not be regarded either as a proven carcinogenic hazard to man or as an assuredly safe pesticide. Chlorobenzilate, mirex, and strobane induced benign hepatomas in mice following oral administration. Aldrin, pentachlorobenzene, and dieldrin are carcinogenic in mice, but no carcinogenic effect was found in rats and dogs. The experimental data on the carcinogenicity of heptachlor and methoxychlor is inconclusive. Lindane induced benign hepatomas in mice treated with daily doses of 99 mg/kg. Aramit induced hepatocellular and bile duct adenomas in dogs and rats but not in mice. Amitrole induced thyroid adenomas and liver carcinomas in rats and mice. Thyroid tumors were observed in mice and rats after oral administration of thiourea. Hepatic and thyroid tumors were induced in rats and mice by orally administered ethylenethiourea. The experimental data on the carcinogenicity of maleic hydrazide, zineb, maneb, and carbaryl are contradictory. Monuron induced tumors of the liver, lung, and glandular stomach. Subcutaneously and orally administered simazine induced papillomas and carcinomas of the glandular stomach and at the injection site. Certain experiments suggest carcinogenic effects for trichlorfon.

76-1528. Mishra, M. M.; Neelakantan, S.; Khandelwal, K. C. (Dep. Microbiol., Haryana Agric. Univ., Hissar, India). **Effect of lindane and thimet on nitrification.** *Haryana Agric. Univ. J. Res.* 2(4): 283-285; 1972. (9 references)

The effect was studied of lindane and thimet (phorate) on nitrification in soil and on nitrifying microorganisms. The normal dose of lindane used on the soil was 1.87 kg active ingredient/ha, and it was applied in the form of a 20% emulsifiable concentrate. The thimet was used at 1.0 kg active ingredient/ha in the form of a solution containing 83% active ingredient. Neither lindane nor thimet had any effect on the conversion of nitrite to nitrate. At normal and ten times normal concentrations, lindane inhibited nitrification during the first three days after application. Thereafter no change was noted. However, at 100 times the normal dose, nitrification was significantly affected for the first 28 days. This depressing effect persisted up to the end of the incubation period. Nitrate forming organisms were only temporarily inhibited for the first 14 days after lindane application. Thimet decreased the rate of nitrification during the initial stages up to 14 days at normal and ten times normal dose levels. However, at one hundred times the normal dose, inhibition persisted to the end of the study (70 days). Thimet also affected the population of nitrite forming organisms only in the very initial stages. Only the formation of nitrite was affected by the treatments. Once the nitrite was formed, it was converted to nitrate as usual.

76-1529. Mehrotra, K. N.; Singh, Y. (Div. Entomol., Indian Agric. Res. Inst., New Delhi-12, India). **Aging in esterases inhibited by organophosphates.** *Indian J. Entomol.* 34(2): 112-114; 1972. (7 references)

A comparative study of 'aging' of house sparrow and rat brain esterases was performed on ChE inhibited by sumioxon (fenitroxon), methyl paraoxon, the oxygen analogue of dicapthon, and paraoxon. 'Aging' is a process by which inhibited ChE changes to a form which is not readily reactivated either spontaneously or with inducing compounds such as pyridine-2 aldoxime-methiodide (PAM, pralidoxime). It is necessary to consider the extent of aging in any study of ChE inhibition and its recovery following organophosphorus intoxication. The results of this study indicated that aging follows first order kinetics in enzyme from either source, and that the enzyme is inhibited by any of the four compounds. It is suggested, based on these experiments, that there may be two types of enzymes present in the brain of both birds and rats, one that is easily reactivated and the other which is not reactivated by PAM and may be stated to undergo instant 'aging'. The enzyme from the bird brain aged at a faster rate than that from the rat. The fastest rate of aging was seen in enzyme inhibited by paraoxon. The rate of aging is supposed to be independent of the organophosphate leaving group, which leaves prior to the aging reaction, and should be dependent on the nature of the alkoxy or other nonleaving group and the enzyme. This is reflected distinctly in the similar rate of aging and $t0.5$ values for sumioxon, methyl paraoxon, and oxygen analog of dicapthon. Paraoxon, having different alkoxy groups, had a significantly different rate as well as $t0.5$ value. The results of this study support the view that the enzyme inhibited by ethyl compounds aged faster than that by methyl compounds, and that the enzyme from birds differs significantly from that of the rat brain.

76-1530. Loeffler, J. E.; Potter, J. C.; Scordelis, S. L.; Hendrickson, H. R.; Huston, C. K.; Page, A. C. (Biol. Sci. Res. Cent., Shell Dev. Co., Modesto, CA 95352). **Long-term exposure of swine to a [^{14}C]dichlorvos atmosphere.** *J. Agric. Food Chem.* 24(2): 367-371; 1976. (20 references)

The effects were studied of a dichlorvos atmosphere on swine. Pigs were exposed for 24 days to determine the key metabolites and their sequence of formation. The rate of delivery of the pesticide-containing air was set to give a concentration of about 0.1 mg dichlorvos/m^3. The animals were exposed to ^{14}C-dichlorvos in the atmosphere and therefore received the compound not only by inhalation but also by absorption through the skin and, to a small degree, orally. The data from the study showed large variazions in the ^{14}C content of different tissues. The isolation of key metabolites in pure form showed that glycine had the highest specific activity, followed closely by serine. Although choline was not isolated from phospholipids in this experiment because of the small amount of labeled material available, the large percentage of total ^{14}C labeled lipid in the phospholipid fraction of the liver makes it likely that most of the radioactivity resides in the choline and/or serine moiety of these compounds. The relative specific activities of the isolated compounds fall into an order compatible with the postulated pathway leading from dichlorvos, after cleavage of the P—O—vinyl bond and dechlorination via a hypothetical symmetrical two-carbon intermediate, to glycine and serine. At the glycine stage the carbon on the 1 position of the vinyl has undergone a dilution of about 5×10^4 and proceeds with little additional dilution through the metabolic pools of the other naturally occurring tissue constituents. There is no indication that a degradation pathway develops after prolonged exposure of animals to dichlorvos vapor which would differ measurably from that occurring during short-term inhalation, gastric or intestinal infusion, or single or multidose oral ingestion.

76-1531. Gradiski, D.; Duprat, P.; Magadur, J. L.; Fayein, E. (Inst. Nat. Rech. Secur., Serv. Chim.-Toxicol., Vandoeuvre-les-Nancy, France). **Etude toxicologique experimentale de l'hexachlorobutadiene. [Toxicological and experimental study of hexachlorobutandiene.]** *J. Eur. Toxicol.* 8(3): 180-187; 1975. (19 references) (French)

The toxicity of hexachlorobutadiene, a chlorinated aliphatic hydrocarbon product, was studied on mice, rats, guinea pigs, and rabbits. The i.p. LD50 values were 76 ± 5 in female mice, 105 ± 15 in male mice, 175 ± 25 in female

rats, and 216 ± 6 in male rats. Oral LD50 values were 65 ± 5 and 80 ± 5 in mice and 270 ± 20 and 250 ± 30 in rats. The acute toxicity is thus appreciable. Behavioral studies on mice indicate that hexachlorobutadiene probably affects the central nervous system; the time it took for the mice which had received hexachlorobutadiene at 30 minutes before pentobarbital administration to fall asleep was significantly longer than for controls: 9.7 ± 1.3 instead of 6.1 ± 1.9. Anatomopathological, hematological, and biochemical results show severe renal and hepatic effects (acute epithelial nephritis with focalized tubular necrosis and without intersitial involvement; parenchymatous dystrophic hepatitis with non-systemic cytoplasmic vesicles) beginning at 120 mg/kg administered in a single intraperitoneal injection in rats. Irritation of the ocular mucosa and skin of rabbits following a single administration was insignificant for the pure compound, slight at a concentration of 10%, and nonexistent at lower concentrations. However, allergic reactions of a delayed type were significant on the skin of guinea-pigs.

76-1532. Ottevanger, C. F. (Shell Nederland Raffinaderij B. V., Rotterdam, Holland). **La fonction neuromusculaire chez des personnes exposees aux plaquettes de resine a dichlorvos. Interet de l'electromyographie. [Neuromuscular function in persons exposed to dichlorvos resin strips. Relevance of electromyography.]** *J. Eur. Toxicol.* 8(3): 192-195; 1975. (9 references) (French)

A study of 13 volunteer men exposed, at home and at work, to dichlorvos resin strips (18.5% dichlorvos) was undertaken. This followed a previous study in which it had been shown that electromyography (EMG) is an effective means of detecting neuromuscular disturbances caused by exposure to organophosphorus pesticides. It was proposed that this method might be a more sensitive indicator of exposure than measurement of cholinesterase activity in the blood. The results of this study indicate that the amplitudes of the EMG tracings made before and after exposure were practically the same. In 6 men, the action potentials were slightly decreased after 6 weeks of exposure and in the other 6 (one man forgot to have an EMG before exposure), they increased slightly. The differences are insignificant biologically and statistically. The average amplitudes for each group (before exposure, 6 weeks later, and 3 months later) were respectively 12.5, 12.3, and 12.5 mV. The values for cholinesterase activity before and 6 weeks after exposure were very similar. The averages are 132 Δ pH/hr before exposure and 130 Δ pH/hr after 6 weeks. Differences between individuals (20%) are within intra-individual limits; they are also below the "minimum incipient toxicity" level (20-25%) determined by Rider. Exposure to dichlorvos will not produce notable changes in the EMG as long as the strips are used according to the instructions. It is not yet possible to confirm whether EMG changes found in industrial and agricultural workers are a direct consequence of cholinesterase inhibition.

76-1533. Fournier, E.; Sonnier, M.; Lecorsier, A. (INSERM, Unit. Rech. Toxicol. Exp., Hopital Fernand-Widal, Paris, France). **Repartition de pesticides organophosphates dans deux plasmas artificiels FSB-FSP. [Distribution of organophosphate pesticides in two artificial plasmas, FSB-FSP.]** *J. Eur. Toxicol.* 8(4): 205-211; 1975. (9 references) (French)

The distribution of organophosphates was studied in two artificial plasmas, FSB and FSP, which simulated human plasma in terms of their contents of mineral salts, proteins, and lipids. The pesticides were gently agitated with the plasma for 2 hr at 37°C and a pH of 7.3. Then the lipids were separated from the aqueous solution by centrifugation, and proteins were removed by precipitation with absolute alcohol. Following separate extraction of each component to remove ciodrin (crotoxyphos), diazinon, dichlorvos, disyston, dyfonate (fonofos), malathion, parathion, phosdrin, phosphamidon, ronnel, systox, and trithion, the compounds were determined by gas chromatography with a flame photometric detector. Thiophosphates have a greater affinity for lipids than phosphates. Protein binding was observed only for three hydrophilic organophosphates: phosphamidon, dichlorvos, and ciodrin.

76-1534. Fournier, E.; Quan, D. Q.; Sonnier, M.; Lecorsier, A.; Bernadou, J. (INSERM, Unit Rech. Toxicol. Exp., Paris, France). **Reactivation par l'hydroxyimino-1 methyl-4 pentanone-2 des cholinesterases plasmatiques de chien inhibees par differents organophosphates. [Reactivation by 1-hydroxyimino-4-methyl pentanone-2 of canine plasma cholinesterases inhibited by various organophosphates.]** *J. Eur. Toxicol.* 8(4): 220-225; 1975. (2 references) (French)

The restoring action of 1-hydroxyimino- 4-methyl pentanone-2 and contrathion (pralidoxime) was studied on dog plasma inhibited by 10 organophosphate pesticides. For each pesticide, the cholinesterase study was paralleled by a control, and was subjected to inhibition, spontaneous reactivation, reactivation by the new oxime, and reactivation by contrathion. Results indicate that, at the same doses, the new-oxime is more active than contrathion for diazinon, DFP, disyston (disulfoton), dyfonate (fonofos), malathion, phosphamidon, and systox (demeton). The activity is especially clear for DFP, dyfonate (fonofos), and systox. However, contrathion is a more effective antidote for ciodrin, parathion, dichlorvos, and phosdrin.

76-1535. Mieth, K.; Beier, D.; Losch, K. (Bezirksinstitut fuer Veterinaerwesen Wusterhausen (Dosse), DDR-1903 Wusterhausen-Dosse, DDR). **Untersuchungen mit Phosphorsaeureesterpraeparaten beim Rind, Schwein und Schaf unter besonderer Beruecksichtigung der Cholinesteraseaktivitaet. 4. Mitteilung: Der Einsatz von Phosphorsaeureesterpraeparaten und deren Einfluss auf die gacetylcholinesteraseaktivitaet beim Schaf. [Studies on or-**

ganophosphorus preparations in cattle, pigs, and sheep with special reference to cholinesterase activity. 4. Administration to sheep and effects on acetylcholinesterase activity.] *Arch. Exp. Veterinaermed.* 29(4): 501-517; 1975. (235 references) (German)

The acetylcholinesterase-inhibiting and toxic effects of trichlorfon and dimethoate (Hypobovin) were studied in sheep. The animals were bathed in 0.025% or 1% trichlorfon solution, sprayed with 0.025, 0.5 or 1% dimethoate solution (0.5-1 liter/animal), or were administered 50-150 mg/kg oral doses of trichlorfon-Wolfen. Certain groups were treated by the pour-on method with 6% trichlorfon solution, corresponding to doses of 36 and 40 mg/kg, or with Hypobovin, corresponding to dose of 56 and 60 mg/kg. In general, acetylcholinesterase inhibition peaked between 4 and 24 hr, with inhibition rates ranging from 20 to 81%. Enzyme reaction was observed in up to 44 hr. Bathing in trichlorfon solution (0.025%) or dimethoate solution (0.025%), spraying with 1% trichlorfon solution or 0.5 and 1% dimethoate solutions, pour-on treatment with Hypobovin and 6% trichlorfon solution, and oral administration of trichlorfon at 50 mg/kg caused considerable acetylcholinesterase inhibition. Despite this enzyme inhibition, no poisoning symptoms were observed.

76-1536. Ando, M.; Wakisaka, I. (Dep. Public Health, Fac. Med., Kagoshima Univ., Kagoshima 890, Japan). **Effect of vitamin A on 2,2-bis(*p*-chlorophenyl) 1,1-dichloroethylene concentration in rat liver.** *J. Nutr. Sci. Vitaminol.* 21(5): 317-322; 1975. (19 references)

Studies were conducted on the *p,p'*-DDE residue in the liver, testis, and adipose tissue of rats loaded with *p,p'*-DDE after feeding a diet without or with an excess of vitamin A. Four groups of male Wistar rats were fed three different diets: one free of vitamin A, one containing 10,000 I.U./kg vitamin A, and one containing 100,000 I.U./kg vitamin A. One group at the 10,000 I. U. dose level received no further treatment. The other three groups received *p,p'*-DDE, p.o. in rapeseed oil at 160 mg/kg. Seven days after dosing the animals were sacrificed. No significant differences were seen in the weights of the liver or testes. A trace quantity of *p,p'*-DDE was found even in the control animals to which none of this chemical had been given. There were no differences in the *p,p'*-DDE storage levels in the testes and adipose tissues of the three treated groups. However, the storage level in the liver was slightly higher in animals which either received an excess of or were deficient in vitamin A. The total lipid content of the liver was significantly higher in rats given *p,p'*-DDE than in controls. The triglyceride content of the liver was significantly higher in groups with an excess or deficiency of vitamin A than in the group receiving an adequate amount of that vitamin. The ratio of *p,p'*-DDE stored in the liver to the content of total lipids was significantly higher in the group receiving excess vitamin A than in those receiving the proper amount of the vitamin. Similarly, the ratio of *p,p'*-DDE storage levels to content of lipids other than triglyceride was significantly higher in the groups receiving deficient or excessive amounts of vitamin A than in the group receiving the proper amount. However, no differences were noted among these three groups in the ratio of *p,p'*-DDE storage level to triglyceride content. The *p,p'*-DDE storage level in the liver apparently increased with increases in liver triglyceride. Either deprivation or excessive administration of dietary vitamin A may be useful for elimination of *p,p'*-DDE and other fat-soluble chlorinated hydrocarbons from the body.

76-1537. Matsumura, F.; Benezet, H. J.; Patil, K. C. (Dep. Entomol., Univ. Wisconsin, Madison, WI 53706). **Factors affecting microbial metabolism of gamma-BHC.** *J. Pestic. Sci.* 1: 3-8; 1975. (12 references)

The extent of microbial metabolism of lindane (γ-BHC) in the environment was examined with particular reference to the nutritional factors affecting lindane metabolism by a strain of *Pseudomonas putida*. Of 354 microorganisms isolated from the environment, the insecticide γ-BHC was metabolized by 71. Two metabolic patterns for the metabolism of γ-BHC were detected in a strain of *Pseudomonas putida*. The pattern followed depended on the nutritional properties of the medium. The most common pathway was dehydrochlorination, where γ-PCCH (1,3,4,5,6-pentachlorocyclohex-1-ene) was formed as a major product. The other pathway is more complex, is NAD dependent, and involves the production of large amounts of γ-BTC (3,4,5,6-tetrachlorocyclehex-1-ene). γ-BHC is formed as a by-product of the second pathway. Further degradation of γ-BTC proceeds via an FAD dependent reductive dechlorination mechanism. In *P. putida* the ring opening process took place on aromatic rings with only a few chlorines such as benzene, monochloro- or at most dichlorobenzenes via an oxidative route to yield carbon dioxide. From these studies it is concluded that a combination of these three different metabolic systems is required to complete the degradation of γ-BHC in *P. putida* via the second pathway.

76-1538. Miyamoto, J.; Mihara, K.; Hosokawa, S. (Res. Dep., Pestic. Div., Sumitomo Chem. Co., Takarazuka 665, Japan). **Comparative metabolism of m-methyl-^{14}C-sumithion in several species of mammals in vivo.** *J. Pestic. Sci.* 1: 9-21; 1975. (40 references)

Absorption, distribution, and biodegradability of m-methyl-^{14}C-labeled sumithion (fenitrothion) were examined in 4 species of mammals including rats, mice, rabbits, and dogs. The insecticide was administered p.o. to rats, mice, and dogs at the rate of 15 mg/kg. In separate experiments designed to clarify the possible accumulation of sumithion in the animal body, groups of 5 male rabbits were fed unlabeled sumithion for 6 consecutive months at levels of 0, 3, and 10 mg/kg/day. Animals receiving 15 mg/kg were sacrificed at 0.5, 1.5, 6, and 24 hr after dosing. The results of this experiment indicate that the stomach and intestine contained larger amounts of radioactivity immediately after treatment, followed by the liver, lung,

and kidney, while other tissues and organs such as the brain, spleen, muscle, eye, and brown fat contained less radioactivity. The radiocarbon disappeared rapidly and at 24 hr after dosing, hardly any detectable amount was found. After 1 hr, three-quarters of the radioactivity had already disappeared. An appreciable amount of sumioxon (fenitroxon), along with 3-methyl-4-nitrophenol and ethyl acetate-soluble and water-soluble radioactive compounds are present in the gastrointestinal contents, suggesting that sumithion is actively biodegraded there. Demethylation products such as desmethylsumithion and desmethylsumioxon constitute one group of major metabolic products and accounted for 10% (rabbits) to 55% (dogs) of the urinary radioactivity. The remaining metabolites consisted mainly of phenolic compounds, free and conjugated. Rabbits exceeded other mammals in contents of these latter metabolites. These 4 species were invariably active in conjugating the phenolic compounds, mainly with sulfate, and to a lesser extent with β-glucuronic acid. No sumithion was detected in the pooled urine of these animals.

76-1539. Miyata, T.; Saito, T. (Lab. Appl. Entomol. Nematol., Fac. Agric., Nagoya Univ., Chikusa, Nagoya 464, Japan). **Mechanism of malathion resistance in the green rice leafhopper, *Nephotettix cincticeps* Uhler (Hemiptera: Deltocephalidae).** *J. Pestic. Sci.* 1: 23-29; 1976. (25 references)

The mechanism of malathion resistance was studied in the leafhopper. The LC50 values for five strains of the green rice leafhopper, Odawara, Koga, Nangoku, Kagami, and Geisei were 21.1, 311, 1,760, 2,740, and 2,140 ppm, respectively. Thin layer agar gel electrophoresis detected 8 esterase bands. Malathion resistant strains showed higher β-naphthyl acetate hydrolyzing activity of E_1, E_2, E_3, and E_4 bands than susceptible ones. The in vitro degradation of ^{14}C-methyl malathion by homogenates of leafhoppers was 5.6, 16.0, and 21.2 times higher in Koga, Nangoku, and Kagami stains than in the Odawara strain. In vitro degradation of ^{14}C-methyl malathion by the enzymes separated by thin layer agar gel electrophoresis showed that E_1, E_2, and E_3 bands showed the degradation activity, with the highest activity on the E_2 band. The susceptibility of the leafhopper head cholinesterase to haloxon was 1/1.9 and 1/9.2 in Koga and Nangoku strains compared to Odawara strain, respectively. The combination of two resistance factors, in vitro degradation of ^{14}C-methyl malathion and cholinesterase susceptibility to malaoxon were $5.6 \times 1.9 = 10.6$ and $16.0 \times 9.2 = 147.2$ in Koga and Nangoku strains, respectively.

76-1540. Hori, M.; Kakiki, K.; Misato, T. (Kaken Chem. Co., Honkomagome, Bunkyo-ku, Tokyo 113, Japan). **Mechanism of polyoxin-resistance in *Alternaria kikuchiana*.** *J. Pestic. Sci.* 1: 31-40; 1976. (10 references)

Possible mechanisms were studied for the polyoxin resistance in *Alternaria kikuchiana*. From the results of the study it appeared that a decrease in the uptake of ^{14}C-polyoxin A or ^{14}C-polyoxin B was closely correlated with the increased level of polyoxin resistance in various strains of *A. kikuchiana*. With decreasing ^{3}H-polyoxin A uptake, the inhibitions of both mycelial growth and ^{14}C-glucosamine incorporation into cell-wall chitin were lowered. In a highly resistant strain the amount of ^{14}C- or ^{3}H-polyoxin A accumulated was less than 10% that in a sensitive strain. In the sensitive mycelia the largest proportion of ^{14}C-polyoxin A was in the fraction consisting mainly of cytoplasm. The antibiotic in the resistant mycelia was absorbed largely on the fraction of mycelial debris. In the sensitive strain the uptake of ^{14}C-polyoxin A varied with its concentration and the pH, and was inhibited by sodium azide, blasticidin S, and Triton X-100. Uptake in the resistant strain was slightly affected by these compounds. Both sensitive and resistant strains inactivated polyoxins A and B mixture to a similar extent. Degradation of the antibiotic was responsible for the inactivation of polyoxin A. The degradative activity of different strains was independent of their polyoxin sensitivity.

76-1541. Jentzsch, R.; Schneider, P.; Fischer, G. W. (Forschungsst. Chem. Toxikol., Akad. Wiss. DDR, Leipzig, DDR). **Organische Phosphorverbindungen. VI. Quantitative Untersuchungen ueber das Alkylierungsvermoegen kernsubstituierter *O,O*-Dimethyl-*O*-phenylphosphate und -thiophosphate. [Organophosphorus compounds. VI. Quantitative investigations of the alkylating activity of ring-substituted *O,O*-dimethyl-*O*-phenyl phosphates and thiophosphates.]** *J. Prakt. Chem.* 317(5): 721-732; 1975. (44 references) (German)

The quantitative aspect of the alkylating activity of ring-substituted *O,O*-dimethyl-*O*-phenyl phosphates and thiophosphates was derived from their reaction velocities during treatment with trimethylamine and 4-(4-nitrobenzyl)pyridine and related to the Hammett substituent constants σ; IR and NMR data, and to pK_a values. Good correlations were obtained with the substituent constants σ, especially the σ constants, and the chemical shifts of the ester groups. The derived reaction constants ρ and reflect the increase in alkylating potential produced by electron-withdrawing substituents. For practical purposes the alkylating activity can be estimated via the chemical shift, IR band or pK_a values of the phenolic ester moiety as the correlation parameter, while the aryl phosphate valence vibrations are of little use and the ^{31}P shifts are of no use in this connection.

76-1542. Jentzsch, R.; Schneider, P.; Fischer, G. W. (Forschungsst. Chem. Toxikol., Akad. Wiss. DDR, Leipzig, DDR). **Organische Phosphorverbindungen. VII. Zur Anwendung linearer Freie-Energie-Beziehungen auf das Alkylierungsvermoegen von Phosphon- und Phosphorsaeureestern. [Organophosphorus compounds. VII. The application of linear free energy equations to the alkylating activity of phosphonic and phosphoric acid esters.]** *J. Prakt. Chem.* 317(5): 733-744; 1975. (41 references) (German)

In order to comprehend the quantitative relationship between structure and alkylating activity of various *O,O*-dimethyl aklanephosphonates and *O,O*-dimethyl-*O*-alkyl phosphates, their reactions with trimethylamine at 100°C were followed kinetically, and the resulting reaction velocities were evaluated along with literature data using the Taft equation employing the substituent constants. The introduction of electron-withdrawing substituents, as expected, raises the rate of the SN2 reactions investigated, in agreement with which the derived reaction constants are positive. Usung the specific substituent constants for organic phosphorus compounds the alkylating activity of phosphonic and phosphoric acid esters can be described. If the polar substituent constant is used, howeer, then differing relationships are found for each type of structure. The substituent attached to the phosphorus atom influences the alkylating activity of the ester not only through inductive effects but aiso through possible π-π interactions.

76-1543. Lin, T. (Dep. Appl. Zool., Taiwan Agric. Res. Inst., Taiwan). **Toxicological study of baythion and cythion on rat feeding test.** *Nung Yeh Yen Chin (J. Taiwan Agric. Res.)* 23(2): 149-154; 1974. (12 references)

Oral feeding tests were conducted to determine the safety of using Baythion (phoxin) in place of Cythion (malathion) in the treatment of stored grain to control insect pests. Baythion and Cythion were fed to rats at concentrations of 1, 2, 4, 6, 10, or O ppm in the diet. Adult rats and their offspring were fed for a period of up to 5 months. No adverse effects were noted as a result of these treatments. It is concluded that 4 ppm Baythion mixed with stored grains could be used as a substitute for Cythion with no adverse effects expected in humans.

76-1544. Risebrough, R. W.; Anderson, D. W. (Bodega Mar. Lab., Bodega Bay, CA 94923). **Some effects of DDE and PCB on mallards and their eggs.** *J. Wildl. Manage.* 39(3): 508-513; 1975. (18 references)

In 1971, 4 groups of mallards (*Anas platyrhynchos*), each consisting of 4 drakes and 10 hens equally divided into 2 replicates per group, were fed untreated feed or feed containing 40 ppm *p,p'*-DDE, 40 ppm PCB, or 40 ppm DDE + 40 ppm PCB. The feeding period began a month before egg laying, which started in February and continued through June. All eggs were collected daily, and mean shell thickness indices were alike in the control and PCB groups. They were reduced by 17 percent in the DDE group and 19 percent in the DDE + PCB group. The contents of 12 eggs randomly selected from the DDE group contained 373 ppm DDE lipid-basis, and 13 eggs from the DDE + PCB group contained mean residues of 344 ppm DDE + 364 ppm PCB. Egg production was similar in all groups for about the first seven weeks, then it dropped markedly in the DDE + PCB group. Part, but not all, of this group's lower production of intact eggs was due to egg eating. This behavior accounted for 18 of 282 eggs observed lost in the DDE + PCB group, 6 or 394 eggs in the PCB group, and none in the control and DDE groups. Although there was no significant change in shell-thinning or DDE residues when PCB was added to the diet, the reduction in the number of intact eggs produced by the DDE + PCB group suggests that the two compounds may nevertheless interact to influence reproductive success. (Author abstract by permission)

76-1545. Mahoney, J. J., Jr. (Zool. Dep., Univ. Georgia, Athens, GA 30601). **DDT and DDE effects on migratory condition in white-throated sparrows.** *J. Wildl. Manage.* 39(3): 520-527; 1975. (34 references)

The onset of spring migratory conditions, as measured by *Zugunruhe* and weight increase, was delayed at least 1 week in caged white-throated sparrows (*Zonotrichia albiocollis*) fed diets containing 5 or 25 ppm technical DDT. Migratory fat stores, determined by extraction from birds sacrificed early in the migratory period, showed a dose-dependent depression which was statistically significant only at the high dose level. Late in the period there were indications of increased *Zugunruhe* in treated birds. In the high treatment group, this increased activity was significantly ($P < 0.05$) correlated with the log of body concentration of DDE, a metabolite of ingested DDT. A similar experiment with birds fed DDE produced no effect in the spring migratory period. Late in the period, *Zungunruhe* showed significant and dose-dependent increases. Daytime activity was not significantly altered. (Author abstract by permission)

76-1546. Nishiuchi, Y. (Agric. Chem. Imspect. Station, Kodaira, Tokyo, Japan). **Testing methods for the toxicity of agricultural chemicals to aquatic organisms.** *Jpn. Pestic. Inform.* 19: 15-19; 1974.

The recommended measure or index of the relative toxicity of agricultural chemicals to fish is the median tolerance limit (TLm) for exposure periods of 24, 48, and 72 hr. The principal test animal is the carp, *Cyprinus carpio*, although other species (e.g., *Pseudorasbora parva*, *Oryzias latipes*) can be used for chemicals which will not be applied in paddies. The test fish should be acclimatized to the test conditions for at least 1 wk and should not be fed during testing. The test should be performed in a glass aquarium of greater than 10 liters capacity and at a uniform temperature between 20 and 28°C. TLm values can be derived by the straight line graphical interpolation method, and toxicity evaluations should be performed for all active ingredients alone and for solvents, when used, as well as for the formulated chemicals. Adult female *Daphnia pulex* or *Moina macrocopa* can be used to determine the acute toxicity of agricultural chemicals to daphnids. Various insecticides, fungicides, and herbicides are ranked at to their toxicity to both carp and daphnids.

76-1547. Etsuchu, T.; Sekiguchi, Y.; Kobayashi, N. (Agric. Chem. Inspect. Stn., Minist. Agric. For., Kodaira,

Tokyo, Japan). [**New pesticides recently registered for agriculture and forestry.**] *Kongetsu No Noyaku (Pestic. Mon.)* 20(2): 94-98; 1976. (Japanese)

The mammalian toxicities of active ingredients are reported for three recently registered pesticides, prothiophos insecticide 2% dust and 50% EC; cypendazole fungicide 45% WP; and dimethirimol fungicide 12.5% liquid. The peroral LD50 values for prothiophos are 1700 mg/kg (male rat), 1750 mg/kg (female rat), 940 mg/kg (male mouse), and 960 mg/kg (femalesmouse). The dermal LD50 values are 3900 mg/kg (male rat) 4100 mg/kg (female rat), 1650 mg/kg (male mouse), and 1600 mg/kg (female mouse). Its TLm (48 hr) to carp is 5.35 ppm. The peroral LD50 values for cypendazole are 2500 mg/kg (rat), 1000 mg/kg (rabbit) and 500 mg/kg (female dog). Its TLm (48 hr) to carp is 1500 ppm. The peroral LD50 values for dimethirimol are 1150 mg/kg (male rat), and 1390 mg/kg (female rat). Its TLm (48 hr) is 85 ppm (calculated from that of the formulation).

76-1548. Giermaziak, H. (Dep. General and Exp. Pathol., Mil. Med. School, Lodz, Poland). **Badania nad wplywem zwiazkow fosfoorganicznych na ustroj na modelu Intrationu.** [**Effect of organic phosphorus compounds (as examplified by Intrathion) on living organisms.**] *Med. Pr.* 24(5): 487-494; 1973. (Polish)

Intrathion (thiometon) was injected intraperitoneally in a 100 mg/kg dose into rabbits (both sexes, 2-3 kg), and its effect on β-glucuronidase (β-GRD), acid phosphatase (AcP), and acid cathepsin-protease (KT) in serum and white blood cell fractions (homogenate, supernatant, and lysosomal fraction) was determined 24 hours later. In addition its effects on alkaline phosphatase (AP), cholinesterase (AChE, ChE), peripheral blood count, blood sugar, ECG, and pathomorphology of the myocardium were also studied. After 24 hours there was a statistically significant increase in β-GRD and AcP activity in the serum and all white blood cell fractions, of KT in serum and white blood cell homogenate, and of AP in serum and lysosomal fraction. The activity of AChE and ChE decreased. There was also a statistically significant increase in number of white blood cells, decrease in red blood cells, and decrease in blood sugar level. The ECG showed a reduced heart rate, lengthening of the PQ interval, and decreased tension of the T segment. Histological examination of the myocardium showed hemorrhagic, edematous, and degenerative changes and necrotic foci. Intravenous administration of pralidoxime (7 mg/kg) had a normalizing effect on the studied parameters of the blood and the ECG, while intramuscular injection of atropine sulfate (0.0005/rabbit) had no effect on heart rate, PQ interval, T segment, or on the lowered hemoglobin and lowered blood sugar levels.

76-1549. Galasinska-Pomykol, I.; Stafanska-Sulik, E. (Biol. Morphol. Inst., Med. Acad. Bialystok, Bialystok, Poland). **Analiza morfologiczna komórek jadra niskowzgorzowego swinek morskich poddanych dzialaniu pestycydu "Alvit-55".** [**Morphological analysis of cells of the subthalamic nucleus of guinea pigs treated with "Alvit-55" pesticide.**] *Med. Pr.* 25(1): 29-37; 1974. (18 references) (Polish)

"Alvit-55" (90% dieldrin) was administered in a single oral dose of 25 mg/kg to female guinea pigs (500-650 g). Generalized clonic spasms developed in some animals (group I) while others (group II) only exhibited different degrees of motor excitation. Animals from both groups were decapitated 4 hours after intoxication; cells of the subthalamic nucleus were examined and compared with controls, and differences were analyzed statistically. The average size of cell nuclei was greater in group I (549.9 μm) and II (513.0 μm) than in controls (373 μm), but the difference was statistically significant only for group I. Of the 4 different cell types (multipolar, fusiform, oval, and triangular) only the multipolar neurons of group I showed statistically valid increases in nuclear volume. In both experimental groups oval nuclei predominated, while in the controls round nuclei were more common. The location of the nucleolus was more frequently acentric in group I than in group II, while a central location was more often seen in group II than group I. These results indicate increased activity of of subthalamic neurons during convulsions caused by intoxication with Alvit-55.

76-1550. Gejewski, D. (Dep. Toxicol., Military Inst. Hyg. Epidemiol., Warsaw, Poland). **Wplyw diazepamu na antyletalne dzialanie siarczanu atropiny i toksogoniny w zatruciach fosfamidonem u szczurow.** [**Effect of diazepam on the antidotal action of atropine sulfate and toxogonin in phosphamidon poisoning of rats.**] *Med. Weter.* 30(8): 484-487; 1974. (29 references) (Polish)

The therapeutic effect of intraperitoneal injection of diazepam (Relanium or Valium) given alone or in combination with atropine, toxogonin (obidoxime), or both immediately following subcutaneous injection of phosphamidon to female Wistar rats was determined 2 and 24 hours later. The LD50 of phosphamidon in these animals was 11.6 mg/kg. Valium (5 mg/kg) increased the LD50 to 16.8 mg/kg, Relanium (5 mg/kg) to 17.2 mg/kg, atropine sulfate (10 mg/kg) to 170.9 mg/kg, and toxogonin (40 mg/kg) to 270.8 mg/kg after 2 hours and 255.1 mg/kg after 24 hours of observation. Combination of atropine with toxogonin increased the LD50 to 1,050 mg/kg at 2 hours and 907 mg/kg at 24 hours. Diazepam enhanced the antilethal effect of atropine by 22% (increasing the LD50 to 219.1 mg/kg) after 2 and 24 hours, increased the antilethal effect of toxogonin by 49% (LD50 427.5 mg/kg) after 2 hours and 37% (LD50 402.3 mg/kg) after 24 hours, and increased the therapeutic effect of the atropine-toxogonin combination by 236% (LD50 2,488 mg/kg) after 2 hours and 132% (LD50 1,200 mg/kg) after 24 hours.

76-1551. Etter, G. E.; Tissier, J. (Author address not given). **Properties insecticides de deux nouveaux phosphoramidothioates; RE 9006 et RE 12420.** [**Properties of**

two new phosphoramidothioate insecticides, RE 9006 and RE 12420.] *Meded. Fac. Landbouwwetensch. Rijksuniv. Gent* 38(3): 1145-1166; 1973. (8 references) (French)

The Chevron Chemical Company synthetized acephate, a derivative of methamidophos, which combines very effective insecticidal activity with a negligible toxicity to man and other animals. Acephate and methamidophos have similar insecticidal properties, but the former is much less toxic than the latter. The dangerous dose for man is similar to that of malathion (5-15 g) for acephate and to that of phosphamidon (0.20-0.40 g) for methamidophos. Acute intoxication is characterized by cholinergic symptoms which appear after 30-90 minutes and disappear completely 1-4 days later. Atropine sulfate and PAM (pralidoxime) injected intravenously are effective antidotes. A cholinesterase study on human volunteers of both sexes given an acephate-methamidophos combination in concentrations found in vegetables treated with acephate showed a decrease in the plasma pseudocholinesterase as the only effect. There were no clinical manifestations. The anticholinesterase activity was a function of the dose of methamidophos. Neither insecticide has allergic, neurotoxic, teratogenic, mutagenic, or carcinogenic effects. Acephate is rapidly metabolized by plants to orthophosphoric acid with intermediate formation of methamidophos and *O,S*-dimethylphosphorothioate; degradation is hydrolytic like that of methamidophos and produces non-toxic metabolites. In animals acephate degradation follows a slightly different scheme and does not produce methamidophos.

76-1552. Oshima, H.; Imai, M. (Res. Inst. Ind. Med., Mie Prefect. Tsu, Mie, Japan). [**Toxicity of 2-methyl-4-chlorophenoxy acetic anilide, a phenoxyacetic acid herbicide. Part 2.**] *Mie Igaku (Mie Med. Sci.)* 19(2): 118-122; 1976. (5 references) (Japanese)

Oral administration of 2-methyl-4-chlorophenoxyacetic anilide (MCPCA), suspended in olive oil, to ICR-mice and Wistar male rats yielded LD50 values of 4500-7570 mg/kg (rat) and 4625-5125 mg/kg (mouse). Autopsy findings showed slight congestion in the pituitary, lungs, liver, kidneys, and spleen. Three-month feeding of a daily diet containing 40, 120, 360, 1080, and 3240 ppm of the anilide produced no animal deaths, except at the 3240 ppm dose level. The major symptoms and findings in rats were reduced RBC; reduced hemoglobin; increased reticulocytes and serum gamma-globulin; liver and kidney weight increases; hypertrophy and darkening of the spleen; precipitation of hemosiderin in the liver, spleen, and bone marrow; increased normoblasts in bone marrow; increased positivity of urino-urobilinogen; and increased positivity of urocoproporphyrin at 3240 ppm. Major symptoms and findings in mice were generally similar to those in rats. The maximum no-effect dose of the anilide in rat and mouse was considered to be 40 ppm (2.81-3.35 mg/kg/day in rat and 5.99-6.71 mg/kg/day in mouse).

76-1553. Weber, T.; Berencsi, G. (Publ. Health Epidemiol. Inst., Szeged Med. Univ., Szeged, Hungary). **Adatok egyes novenyvedo szerek toxicitasarol a kornyezeti jomerseklet fuggvenyeben.** [**Toxicities of pesticides in relation to environmental temperature.**] *Munkavedelem* 20(7-9): 25-28; 1974. (39 references) (Hungarian)

The influence of different ambient temperatures on the acute oral toxicity of methyl parathion (Wofatox) and dinitro-*o*-cresol ammonium salt (Krezonit E) was studied in mice through determination of the LD16, and LD84 values according to the Litchfield-Wilcoxon method. The duration of the experiments was 48 hr. At 18-20°C ambient temperatures, the LD16, LD50, and LD84 were found to be 12.7 mg/kg, 14.7 mg/kg, and 17.3 mg/kg, respectively. Wofatox proved to be more toxic at both lower and higher temperatures; the LD16, LD50, and LD84 values measured at 5-7°C were 9.3; 11.8, and 14.8 mg/kg, and those found at 28-30°C were 10; 12.5, and 16 mg/kg, respectively. The LD50 of Krezonit E was 44 mg/kg (41-47 mg/kg) at 18-20°C, 52.2 mg/kg (47.8-56.9 mg/kg) at 5-7°C, and 40 mg/kg (35-45.6 mg/kg) at 28-30°C.

76-1554. Wild, D. (Zentrallab. Mutagenitaetsprufung, Dtsch. Forschungsgemeinshcaft, Freiburg i. Br., Germany). **Mutagenicity studies on organophosphorus insecticides.** *Mutat. Res.* 32(2): 133-150; 1975. (50 references)

The results of a pesticide test program conducted by the Zentrallaboratorium fur Mutagenitaetsprufung of the Deutsche Forschungsgemeinschaft are reviewed, along with relevant results published by other groups. Although DNA alkylation has not been unequivocally demonstrated in vivo, the organophosphorus insecticides are chemical alkylating agents. Induction of gene mutations in microorganisms in vitro has been unequivocally demonstrated with bidrin (dicrotophos), dichlorvos, dimethoate, methyl parathion, and oxydemetonmethyl. The primary step in the production of microbial mutants is alkylation of DNA bases, and misrepair of the primary lesions appears to be an additional requirement. A different, indirect mechanism, possibly acting via protein alkylation, is probably involved in DNA disintegration by dichlorvos. Although dichlorvos has yielded negative results in mammalian mutation tests, assessment of the potential safety of this compound with regard to genetic hazard should not be made exclusively on the basis of these negative tests. For this assessment, the available data on DNA alkylation and mutagenesis in microbes and the effects on mammalian metabolism should be considered. It is unlikely that dichlorvos, under conditions of normal use as an insecticide, can exert significant mutagenic effects in mammals. Mutation tests with malathion and malathion acid in mammals will be important for a judgement on malathion. The potential mutagenicity of bidrin, bromophos, diazinon, dimethoate, fenitrothion, methyl parathion, oxydemetonmethyl, parathion, trichlorfon, and *p*-nitrophenol for humans cannot be judged, at present whereas the mono- and di-esters

of phosphoric acid probably do not constitute a genetic hazard.

76-1555. Shanks, V. (Wallaceville Animal Res. Cent., Res. Div., Ministry Agric. Fish., P.B., Upper Hutt, New Zealand). **Fenchlorphos residues in the milk of cows and in the tissues of sheep after "pour-on" treatment.** *N. Z. J. Exp. Agric.* 3(1): 37-41; 1975. (16 references)

Results are presented from four trials in which lactating cows and dry sheep were treated with a "pour-on" fenchlorphos formulation at rates of 7.5 to 30 mg a.i./kg body weight. The maximum levels of fenchlorphos residues in milk fat averaged 1.8 ppm about 3 days after treatment. All milk fat residues dropped to 0.01 ppm or less at 28 days after treatment. Fourteen cows were treated 1-34 days before parturition at the rate of 20-30 mg a.i./kg. The maximum fenchlorphos residue in the milk fat was 2.1 ppm. In the experiments conducted on sheep, residues in omental fat were higher and more persistent when fenchlorphos was applied over a shorn area of the back as a "pour-on" at rates of 25-100 mg a.i./kg and spread over a large area of skin than when the treatment was confined to a smaller area. The main site of fenchlorphos in sheep was depot fat, in which residue concentrations were at least 10 times higher than in other edible tissues. In none of the treated animals were any signs of toxicity or depression of erythrocyte cholinesterase activity observed.

76-1556. Camper, N. D.; Shively, J. M. (Dep. Bot., Water Resour. Res. Inst., Clemson Univ., Clemson, SC 29631). **Effects of selected herbicides on bacterial populations in fresh and treated water.** *Natl. Tech. Inform. Serv.*, PB-240 972, 1974, 16 p. (4 references)

Bacterial populations in untreated and herbicide-treated waters were subjected to three different herbicides. Diuron, dichlobenil, and diquat were added (100 mg/l) to water samples from two freshwater lakes and two herbicide-treated ponds. Total numbers of bacteria were monitored. Bacterial populations in fresh lake water decreased initially after herbicide additions; however, final populations were significantly greater than in the controls. Similar observations were recorded for bacteria in dichlobenil- and diuron-treated water. Selective enrichment is implied by the results of these experiments. (Author abstract by permission)

76-1557. Sugimoto, T. (Inst. Biol., Nippon Noyaku Co. Ltd., Tokyo, Japan). [**Ocular disturbances due to paraquat (gramoxone) and their alleviation.**] *Nippon Kogyo Eisei Gakkai Nenkai Hokoku (Proc. Jpn. Ind. Hyg. Soc. Annu. Meet.)* 49: 46-47; 1976. (6 references) (Japanese)

Experiments to clarify gramoxone-induced ocular injury were performed with white male guinea pigs. Technical paraquat dichloride, gramoxone, or a detergent (0.01 ml diluted aqueous solution, respectively) was dropped into one eye of the test animals. Gramoxone induced ocular injury, evidence by a turbid cornea, at a rate equivalent to a paraquat dichloride level of 25 μg/eye. Degree of injury increased with larger doses. Paraquat dichloride produced only slight injury, such as palpebritis, even at 400 μg/eye. No injury was caused by the detergent. When the animals were administered a combination of paraquat dichloride and detergent solution, ocular disturbance was the same as with gramoxone. The degree of injury was greatest when the amount of detergent was 25-50% that of the paraquat dichloride. The herbicidal activity was of a 1.4 mixture of calcium acetate and paraquat dichloride nearly equal to that of gramoxone, but no ocular injury was produced.

76-1558. Ando, M.; Wakisaka, I. (Sch. Public Health, Fac. Med., Kagoshima Univ., Kagoshima, Japan). [**The effect of cadmium on the metabolism of *p,p'*-DDT.**] *Nippon Koshu Eisei Zasshi (Jpn. J. Public Health)* 22(10 Suppl.): 493; 1976. (Japanese)

To determine the effect of cadmium on the metabolism of *p,p'*-DDT by living organisms, 4 treatments of female Wistar rats were used: control, subcutaneous injection of cadmium dichloride at 1 mg/kg, p.o. administration of *p,p'*-DDT at 20 mg/kg, and subcutaneous injection of cadmium dichloride plus p.o. administration of *p,p'*-DDT. The group given cadmium dichloride showed lower residues of *p,p'*-DDT, and in the group given cadmium dichloride, the ratio of *p,p'*-DDT/*p,p'*-DDD and the ratio of *p,p'*-DDT/*p,p'*-DDE were both higher than in the group not given cadmium dichloride. Thus cadmium dichloride seems to accelerate the metabolism and excretion of *p,p'*-DDT. However, in a separate experiment, cadmium dichloride did not affect the sleeping time due to 100 mg of hexobarbital per kg, and therefore the accelerating action of cadmium dichloride on metabolism of DDT seems questionable.

76-1559. Hosotsuji, T. (Inst. Phys. Chem. Res., Wako, Saitama, Japan). [**Agricultural pesticides and the biological environment.**] *Nippon Noyakugakkai Shi* 1(1): 77-82; 1975. (13 references) (Japanese)

The reactions which agricultural pesticides undergo in a biological environment and methods by which newer agricultural pesticides are developed are discussed. The minimum necessary factors involved in a complex biological environment are meterological conditions, soil conditions, host-pest interactions, condition of hosts, condition and strain of pests, and growth and reproduction of hosts and pests. The necessity of analyzing the environment and of creating an artificial environment which includes host and pest, are described. Facilities for making artificial environments are outlined in detail.

76-1560. Anonymous. [**Plant protection and pesticide news. Napropamide herbicide WP and dimethatryne-**

piperophos herbicide WP.] *Nogyo Oyobi Engei (Agric. Hortic.)* 51(2): 99-100; 1976. (Japanese)

The respective toxicities of the herbicides napropanide and dimethatryne-piperophos, a.i., to mammals and fish were described. The active ingredient of napropamide, 2(α-naphthoxy) *N,N*-diethylpropionamide, has an LD50 p.o. of more than 7000 mg/kg; intragastric of 2454 mg/kg; i.p. of 370 mg/kg (male) and 1067 mg/kg (female); s.c. more than 7000 mg/kg, mouse; and TLm (48 hr) of 10-40 ppm (carp). The active ingredient of dimethatryne, 2-methylthio- 4-ethylamino-6- (1,2-dimethylamino)-*s*-triazine, has an LD50 p.o. of 3000 (male) and 3750 (female); i.m. 1630 (male) and 1780 (female) mg/kg for mouse; p.o. 2120 (male and female); and i.m. 2050 (male) and 200 (female) mg/kg in rat. The active ingredient of piperophos, *S*-(2-methyl-1- piperidyl- carbonylmethyl) *O,O*-dipropyl dithiophosphate, has as LD50 p.o. of 410 (male) and 330 (female) mg/kg; i.m. 1260 (male) and 14.0 (female) mg/kg for mouse; p.o. 1240 (male) and 1260 (female) mg/kg; and i.m. 2650 (male) and 2520 (female) mg/kg for rat. These two herbicidal formulations are not designated as poisonous materials in Japan.

76-1561. Kuwatsuka, S. (Fac. Agric. Nagoya Univ., Nagoya, Aichi, Japan). [**Degration of herbicides in soil.**] *Noyaku Kagaku* 3(3): 107-122; 1976. (145 references) (Japanese)

Although the behavior and fate of herbicides in farm soils have been extensively studied, especially in the United States, little has been published on these phenomena in soils of submerged rice fields. Herbicides applied to rice plants in submerged fields are generally absorbed into the submerged soil and then diffused into the soil with water leakage. Almost all herbicide disappearance in such soils is due to degradation by microorganisms except for Cl-substituted triazines. Effects of soil properties and soil environment on the degradation of herbicides were described. The degradation of several herbicide groups, phenoxyacetic acid derivatives, phenolic derivatives, diphenyl ether derivatives, triazine derivatives, phenylurea derivatives, acetanilide derivatives, phenyl carbamates, thiocarbamates, and fatty acid and benzoic acid derivatives, was described in detail.

76-1562. Gurova, A. I.; Alekseeva, N. P.; Gorlova, O. E.; Chernyshova, R. A. (Patrice Lumumba Peoples' Friendship Univ., Moscow, USSR). **O toksichnosti dimetiltsianamida.** [**Toxicity of dimethylcyanamide.**] *Gig. Tr. Prof. Zabol.* 11: 23-27; 1975. (14 references) (Russian)

An experiment was conducted to study the toxicity of dimethylcyanamide. Repetitive doses (1/5, 1/10, or 1/30 LD50) weresadministered to white mice, rats, and guinea pigs orally, in the diet, and by inhalation. Acute toxicity effects of dimethylcyanamide were characterized by dyspnea and convulsions in the rodents. The histological results revealed hemorrhages in the lungs, kidney, and liver. Vacuolization of the cytoplasm and lymphatic infiltration of the parenchyma were detected in the liver. Results showed LD50 values of 73 mg/kg (mice, gastric administration), and 146 mg/kg (rats and guinea pigs gastric administration). The LD50 for oral application in mice was 125 mg/kg. The inhalation LC50 in mice was 2800 mg/m^3, and it was 2500 mg/m^3 in rats. The TLV for mice and rats was 100 mg/m^3. The compound displays a very poorly marked functional cumulation. The mechanism of its action is analogous to that of inorganic cyanamides. A concentration of 0.5 mg/m^3 is recommended as a tentatively safe level for application.

76-1563. Dremova, V. P.; Gleyberman, S. E.; Smirnova, S. N.; Voronkina, T. V.; Tsetlin, V. M.; Markina, V. V. (All-Union Sci. Res. Inst. of Disinfection and Sterilization, Moscow, USSR). **Izuchenie los'ona "Deta-1", ego repellentnoy effektivnosti i toksichnosti dlya teplokrovnykh.** [**DETA-1 lotion: its repellent effectiveness and toxicity to warm-blooded animals.**] *Med. Parazitol. Parazit. Bolez.* 43(1): 67-73; 1974. (5 references) (Russian)

The repellent effectiveness and toxicity of the repellent lotion DETA-1, consisting of diethyltoluamide and benzoylpiperidine dissolved in dimethylphthalate and ethanol, was studied in test animals and in human volunteers. The acute oral LD50 in albino mice was determined to be 1,470-1,978 mg/kg, and it caused no deaths after skin application at rates of 5,000-10,000 mg/kg. Complexstests on rabbits and guinea pigs revealed no allergic reactions, and no skin irritation was observed after application at a rate of 2-3 mg/cm^2. Both animal tests and observations of 265 volunteers revealed no skin alterations or changes in the renal and hepatic function or in the blood composition. No changes were found in the liver, kidneys, spleen, myocardium, or lungs of experimental animals. The general use of the repellant lotion has been approved by the USSR Ministry of Public Health Pharmacological Committee.

See also **76-1384** **76-1445**

76-1564. Keszthelyi, B.; Mod, L. (Csongrad County Counc. Pharm. Cent., Csongrad, Hungary). **Szerves foszforsaveszter-szarmazekok vekonyreteg-kromatografias vizsgalata. [Thin-layer chromatographic examination of organic phosphate ester derivatives.]** *Acta. Pharm. Hung.* 43(6): 256-262; 1973. (27 references) (Hungarian)

A thin-layer chromatographic method was developed for determining residues of organophosphorus pesticides (trichlorfon, chlorfenvinphos, fenthion, methyl parathion, malathion) in plant materials. Results of residue analyses by this method in fruits are presented. Fruits are macerated in a fruit centrifuge and extracted with chloroform or methylene chloride; a hexane-acetone mixture is used as the TLC solvent system. Silica gel G is used for determination. Visualization can be accomplished with iodine vapor, bromine-saturated carbon tetrachloride, chromosulfuric acid with potassium permanganate, or 4-*p*-nitrobenzyl pyridine with ethylenediamine in acetone. Investigations of 18 fruit samples 5-8 wk after the required waiting time following treatment showed residue levels below the maximum allowable concentration in 27.7%. The residue levels were within acceptable limits in fruits from orchards in which the pesticides had been applied according to the instructions; 6 of 13 samples from small private orchards contained residues in excess of the acceptable level.

76-1565. Kosmatyi, E. S.; Chebotko, K. A.; Kavetskii, V. N. (Ukr. Res. Inst. Plant Protect., USSR). **Khromatograficheskoe povedenie khlororganicheskikh pestitsidov (DDT, γ-GKhTsG, GPKh) v tonkom sloe silikagelya. [Chromatographic behavior of organochlorine pesticides (DDT, γ-BHC, heptachlor) on thin silica gel layers.]** *Adsorbtsiya Adsorbenty* (3): 31-32; 1975. (15 references) (Russian)

An experiment was conducted to prove that by changing the dielectric permeability (DP) of solutions, the process of chromatography can be regulated. Silica gel type KSK-2 (100 grains), containing 10% gypsum, was used for the experiment. The silica gel was mixed with gypsum for 10 min. Water was added continuously in a 2:1 ratio. The resulting mass was spread on a 9 x 12 cm glass plate and dried for 30 min at room temperature, then for 1 hr at 90-100°C. The plate was then placed in a chromatographic chamber. Mixtures such as heptane/acetone, *n*-hexane/acetone, cyclohexane/acetone, and carbon tetrachloride/acetone were used as mobile phases. The amount of acetone used was regularly increased to obtain a series of mobile phases with a DP of 2-8. The chromatogrmas were then treated with a chromogenic reagent, a 1% solution of diphenylamine in acetone, under UV radiation. As a result, DDT, γ-BHC, and heptachlor appeared as dark blue spots on a white background. The experiment showed that the addition of acetone to a nonpolar solvent increases the spots until a DP of 3.5-4.0 is reached. The information obtained can be effectively utilized in the study of the chromatographic behavior of organochlorine pesticides.

76-1566. Anand, R.; Gore, M. G.; Kerkut, G. A. (Dep. Physiol. Biochem., Univ. Southampton, Southampton, England). **An automated method for acetylcholinesterase kinetics.** *Anal. Biochem.* 70(2): 463-469; 1976. (11 references)

An automated assay for acetylcholinesterase was developed, based on the manual spectrophotometric method of Ellman et al. With this technique, the enzyme is preincubated with buffer with or without a drug for a predetermined amount of time. The reaction is initiated by the automatic addition of the substrate and allowed to proceed for a finite time, over which it is linear. The reagent DTNB is then added and the color developed is read by a colorimeter and recorded. Dialysis is not required and the assay works equally well using either a pure solubilized enzyme or a crude tissue homogenate. The method was used to determine the enzyme activity of an unknown sample and the dependence of initial rates given by a fixed enzyme concentration on the substrate concentration. Methods to minimize enzyme modification by DTNB are described. Modification of the conventional autoanalyzer procedure permitted rapid and reproducible enzyme kinetic analysis under various conditions and helped to minimize the effects of possible enzyme inactivation at high dilutions, especially when using crude enzyme preparations.

76-1567. Simoneit, B. R.; Smith, D. H.; Eglinton, G. (Org. Geochem. Unit, Sch. Chem., Univ. Bristol, Bristol, England). **Application of real-time mass spectrometric techniques to environmental organic geochemistry. I. Computerized high resolution mass spectrometry and gas chromatography-low resolution mass spectrometry.** *Arch. Environ. Contam. Toxicol.* 3(4): 385-409; 1975/76. (41 references)

LOGOS, an integrated mass spectrometer/computer system, has been employed in a series of experiments which illustrate the utility of automated techniques of real-time mass spectrometry in the study of organic compounds in the environment. These techniques are shown to be particularly useful in resolving complex mixtures of organic compounds encountered in environmental studies. Complete high resolution mass spectrometry, particularly when used in conjunction with combined gas chromatography/mass spectrometry, and auxiliary techniques such as stable isotopic labeling are described to illustrate the type and scope of information that may be obtained. Illustrative samples include extracts of air- and waterborne particulates, extracts of water-soluble organic materials, and a DDT metabolite from sewage sludge. (Author abstract by permission)

76-1568. Eberle, D. O.; Gerber, H. R. (CIBA-GEIGY Ltd., Agrochem. Div., Basel, Switzerland). **Comparative studies of instrumental and bioassay methods for the analysis of herbicide residues.** *Arch. Environ. Contam. Toxicol.* 4(1): 101-118; 1976. (26 references)

A study of the quantitative analysis of herbicide residues by both chemical and bioassay methods in soils is presented. Field and laboratory residue trials were carried out with a representative member of the following groups of herbicides: ureas, triazines, diphenylethers, phenoxyacetic acids, and dithiophosphates. Representative samples were taken at different time intervals, and degradation curves were established both by chemical methods and by two types of bioassay. Chemical analysis either separated active ingredient and metabolites by chromatographic techniques or included total residues. Bioassays were performed using either monocotyledons and dicotyledons or algae. The results obtained by chemical and bioassay analysis for the degadation rates of chlortoluron, ametryn, 2,4-D, and C 19490 (piperophos) showed a correlation coefficient of 0.914, indicating that the two methods gave almost identical results. Especially with the highly adsorbed urea and triazine herbicides, the uptake of biologically active material by test plants was slightly less than the solvent-extractable parent compound plus its metabolites, and so the absolute level of residues obtained by bioassay was lower. In the case of fluorodifen, the correlation between the methods was not established. The bioassay showed higher resiudues and slower degradation than chemical analysis. Various factors which could explain this anomalous result are discussed. (Author abstact by permission)

76-1569. Gruebner, P. (Pflanzenschutzamt, Rat Landwirtschaft. Produkt. Nahrungsguterwirtsch. Bezirkes Dresden, Dresden, DDR). **Duennschichtchromatographische-enzymatische Rueckstandsbestimmung von Demephion nach Oxydation zum Thiolester-Sulfon. [Thin-layer chromatographic and enzymatic determination of demephion residues following oxidation to the thiol ester sulfone.]** *Arch. Phytopathol. Pflanzenschutz.* 9(6): 395-405; 1973. (20 references) (German)

The thin-layer chromatographic and enzymatic determination of demephion residues is less subject to interference from cholinesterase inhibitors in plants and is simpler to perform if the substance and metabolites are first oxidized to the thiol ester sulfones. Accordingly, 100 g plant material homogenized in 50 ml ethanol is filtered, and the residue is extracted with 150 ml ethanol. The combined filtrates are warmed to 40°C under vacuum to remove the solvent. The residue is treated with 15 ml 1 *N* potassium permanganate solution in 5 ml 0.1 *N* sulfuric acid for 30 minutes. The product is extracted with chloroform, dried over sodium sulfate, and evaporated, with the residue taken up in 1 ml acetone. The eluent is chloroform-methanol (95 + 5). Detection is enzymatic, with liver homogenate, β-naphthyl acetate as the substrate, and fast blue salt B. Semiquantitative determinations can be made by comparing spot size. After cleanup the plant extracts can be oxidized directly upon the slide after spotting, which eliminates the oxidation step.

76-1570. Krauthacker, B. (Inst. Ind. Med., Zagreb, Yugoslavia). **Metode odredivanja *O,O*-dimetil 2,2,-trikloro-1-hidroksietil fosforata (DMTHF). [Methods for the determination of O,O-dimethyl 2,2,2-trichloro-1-hydroxyethyl-phosphonate (DMTHF).]** *Arh. Hig. Rada. Toksikol.* 26(2): 157-169; 1975. (82 references) (Serbo-Croatian)

Existing literature is reviewed on methods for determining the organophosphorus pesticide and the drug DMTHF (trichlorfon) in samples of different origin. According to their objectives and the mode of determination the methods are grouped into the systems of extraction and qualitative and quantitative methods (chromatographic, photometric, polarographic, and titration) for determining the DMTHF. The sensitivities, whenever cited in the original paper, are also given.

76-1571. Nesemann, E.; Rabitz, H.; Seehofer, F. (B.A.T. Cigaretten-Fabriken GmbH, Forsch. Entwicklung, Hamburg, Germany). **Methoden zur quantitativen Bestimmung von Bioziden in Tabak und Tabakerzeugnissen. IV. Mitteilung: Eine Methode zur Bestimmung von Maleinsaurhydrazid. [Methods for the quantitative determination of biocides in tobacco and tobacco products. IV. Method for determination of maleic hydrazide.]** *Beitr. Tabakforsch.* 7(4): 240-243; 1974. (4 references) (German)

The determination of maleic hydrazide can be carried out by the reduction of maleic hydrazide to produce hydrazine for a spectrophotometric determination. Accordingly, 1 g ground tobacco is treated with 50 mg of 50% sodium hydroxide, some paraffin, and then heated to 165°C for 10-15 min. after which it is cooled to 130°C. A mixture of 0.5 g ferrous chloride and 15 g zinc is added, and the temperature is brought back up to 165°C with steam passing through. The distillate is collected in a graduated cylinder containing 4 ml 1 *N* sulfuric acid at a rate of 96 ml distillate in 20 min. The distillate is shaken with 2 g active carbon for 1 min, then filtered by suction, and evaporated to 6 ml of concentrate. To this solution 6 ml of 1.5% dimethylaminobenzaldehyde in 1 *N* sulfuric acid is added, and the resulting solution is diluted to 25 ml. The determination is carried out at 455 nm with an accuracy of 90-101% for the entire procedure.

76-1572. Anonymous. **CORESTA-Methode Nr. 1 (Juni 1974). Methode fur die Bestimmung von Dithiocarbamaten in Tabak. [CORESTA Method No. 1 (June 1974). Method for the determination of dithiocarbamates in tobacco.]** *Beitr. Tabakforsch.* 8(2): 107-108; 1975. (German)

This method is based upon the instability of dithiocarbamates in the presence of formic acid and ascorbic acid when heated. Accordingly, 5 g tobacco with 50 ml of 5% sodium ascorbate are placed in a flask, which is then shaken well and left to stand 5 min. Then 50 ml of 70% formic acid is dripped in, and the flask is then heated to boiling, at which time a stream of nitrogen is passed through the system at 25 ml/min for 45 min. The stream passes through a sulfuric acid trap and two traps containing 1 *N* potassium hydroxide in 95% methanol (aqueous).

Afterwards the contents of the potassium hydroxide traps are combined and diluted to 50 ml with water. After 15 min, the resulting solution could be analyzed spectrophotometrically to determine the amount of xanthate formed with the carbon disulfide from the breakdown of the dithiocarbamates.

76-1573. Anonymous. **CORESTA-Methode Nr. 2 (September 1974). Methode fur die Bestimmung von Rueckstaenden an Organochlor-Pestiziden in Tabak.** [**CORESTA Method No. 2 (September 1974). Method for the determination of residues of chlorinated pesticides in tobacco.**] *Beitr. Tabakforsch.* 8(2): 109-111; 1975. (German)

This method is based upon the gas chromatographic determination of pesticides present in the acetonitrile extract of cut tobacco. The extract from 20 g tobacco with 280 ml acetonitrile/water (5:2 v/v) is filtered, and the filtrate is extracted with *n*-hexane after 150 ml of 2% sodium chloride solution has been added. The aqueous phase is then extracted a second time with 25 ml *n*-hexane. The combined *n*-hexane extracts are then dried by passing them through a column of anhydrous sodium sulfate, and the resulting solution is concentrated to 1 ml in vacuo. This concentrate is then run through a chromatographic column packed with 2 g Florisil wet with *n*-hexane. The sample is eluted with *n*-hexane to give 25 ml eluate; then with benzene for a second eluate of 25 ml. Then 1 μl of each fraction is subjected to gas chromatography.

76-1574. Piedade, M. F.; Yajima, T. W.; Piedade, R. J. (Dep. Chem., Biol. Inst., Sao Paulo, Brazil). **Analise polarografica de lindane CE e lindane** + cobre PS. [**Polarographic analysis of lindane (EC) and lindane (EC)**+ copper (dust).] *Biologico* 39(12): 341-343; 1973. (5 references) (Portugese)

Four standard samples of 21.7% lindane EC (emulsifiable concentrate); 17.9% lindane EC; 23.7% lindane + 7.5% copper oxychloride; and 1.3% lindane PS (dust) + 7.5% copper oxychloride, which are used in the control of coffee pests, were analyzed by a new polarographic method. A standard curve was first established using pure lindane which contained a minimum of 99.9% of the γ-isomer, and a proportionality factor was calculated and used in the formula for the determination of the γ-isomer percentages. Samples of 0.1 g from each of the four formulations of lindane, in 30 ml benzene solution, were passed through a chromatographic column packed with 70/325 silica gel and eluted with benzene to a total 200-250 ml of fractions collected. After elimination of the solvent, 5 ml of the residue was processed for polarographic analysis and read at 0.5-1.7 volts. An average of 5 readings were taken for each sample. The results showed great accuracy with lindane percentages of 21.75%, 18.19%, 23.77%, and 1.30% for the four formulations, vs. false results of 30.41%, 30.70%, 31.52%, and 1.57% obtained with an older method.

76-1575. Peterson, J. E.; Stahl, K. M.; Meeker, D. L. (U.S. Fish Wildl. Serv., Wildl. Res. Cent., Denver, CO 80225). **Simplified extraction and cleanup for determining organochlorine pesticides in small biological samples.** *Bull. Environ. Contam. Toxicol.* 15(2): 135-139; 1976.

A technique is described which permits rapid, accurate analysis of organochlorine pesticides and similar compounds and of at least 3 organophosphate pesticides: malathion, parathion, and methyl parathion. Analyses have been performed on plant parts, animal tissues, blood, blood fractions, milk, urine, and eggs. The method is the same for all samples except that the ratios of the sodium sulfate desiccant and the extraction solvent differ for solid and liquid samples. Solids are prepared for extraction by thoroughly grinding samples in a sodium sulfate/sample ratio of 8:1. The liquid samples are also mixed in a ratio of 8:1 (sodium sulfate/sample w/w). The mixture is chilled in the mortar until it becomes brittle and is then briefly ground. All or part of the sample is extracted by vigorous shaking for at least 10 min with 20% acetone in isooctane (v/v) at a ratio of 10 ml solvent/1 g solid sample equivalent or 5 ml solvent/1 ml liquid sample equivalent. After solids have settled, an aliquot of the extract is centrifuged at 1,800 rpm for 3 to 4 min. If the results are to be on a lipid-weight basis, a small portion of the clarified extract is withdrawn and evaporated at 70°C in a tared beaker to determine lipid equivalent. An amount of the clarified extract representing 0.4 g of the starting sample is transferred to a culture tube and dried with clean, dry air. For liquid-liqiud partition 4.0 ml of isooctane-saturated acetonitrile is added to the tube containing the dry sample residue, along with 2.0 ml of acetonitrile-saturated isooctane. The tube is shaken for 5 min and centrifuged at 1800 rpm until phase separation is complete. The entire lower layer is withdrawn and placed in a larger culture tube. The isooctane layer is partitioned as before with another 4.0 ml of isooctane-saturated acetonitrile. This acetonitrile layer is combined with the first one. To the 8.0 ml of combined acetonitrole solution, isooctane is added at a volume determined by room temperature: 3.3 ml is added for temperatures between 62 and 70°F; 3.2 for 72-78°F, and 3.1 ml for 80-82°F. The tube is nearly filled with a solution of 0.5% sodium sulfate in water (w/v), capped, and shaken for 3-5 min. When the layers separate, the upper layer should have a volume of 4.0 ml. Of this isooctane layer, 2.0 ml is withdrawn, placed in a 15- x 100-mm culture tube, and reduced just to dryness with air. To this dry residue, 0.4 ml of 5% methanol in isooctane (v/v) is added, yielding a sample equivalent of 0.5 ml of sample/microliter. To this solution is added 0.2 g Florisil. The Florisil is swirled in the solvent and then coalesced by immersing the bottom of the tube in an ultrasonic cleaner tank for a few seconds. After standing a few min, the solvent is clear and ready for gas chromatography. For routine analyses, electron-capture detection with two unlike columns (QF-1 and OV-1) is used.

76-1576. Gabica, J.; Benson, W. W.; Watson, M. (Idaho Epidemiol. Studies Program, Dep. Health Welfare, Envi-

ron. Serv. Div., Statehouse, Boise, ID 83720). **A rapid and sensitive method for gas chromatographic analysis of the selective piscicide, "squaxon" [sic].** *Bull. Environ. Contam. Toxicol.* 15(2): 155-161; 1976. (7 references)

An analytical method has been devised whereby petroleum ether-extracted, brominated squaxon (squoxin) can be quickly and easily detected in water and fish tissue by electron capture gas chromatography. This report describes the analysis of squawfish muscle tissue as a representative sample. One gram of tissue was weighed and placed in a small soxhlet thimble. This was inserted into a 125 ml soxhlet flask and extracted with 100 ml of petroleum ether for 6 complete cycles. The ether extract was then evaporated to dryness by placing the flask under a stream of dry air. Twenty ml of brominating solution were added to the flask and allowed to react for 1 hr, with intermittent mixing. The contents were then decanted into a 30 ml screw-cap glass tube, from which the brominated squaxon was then extracted with petroleum ether. One ml of petroleum ether was added to the tube, which was then capped and agitated on the rotary mixer at 50-60 rpm for 30 min. The contents were allowed to separate and as much as possible of the ether layer was removed by disposable pipette and placed in a 13 ml centrifuge tube. The extraction was then repeated once more with an additional 1 ml aliquot of petroleum ether. The combined ether extracts were concentrated to a 1 ml volume, and six microliters of this were injected into the gas chromatograph. The squaxon peak was clean and definitive in all cases, and the relation between peak height and squaxon concentration was linear throughout all the various concentrations analyzed (50-300 ng).

76-1577. Closset, J. L.; Copin, A.; Dreze, Ph.; Alderweireldt, F.; Durant, F.; Evrard, G.; Michel, A. (Serv. Phys. Chim., Phys., Chim. Anal., Fac. Sci. Agron. Etat, Gembloux, Belgium). **Recherche dans la serie des 1,2,4-triazoles. Micropreparation et etude physicochimique du 3-nitro-1,2,4-triazole. [Study of the 1,2,4-triazole series. Synthesis and physicochemical study of 3-nitro-1,2,4-triazole.]** *Bull. Soc. Chim. Belg.* 84(11): 1023-1031; 1975. (23 references) (French)

Laboratory synthesis, isolation, and NMR spectrometric and IR spectrometric investigations of 3-nitro-1,2,4-triazole are described. The substance was synthetized by the addition of sodium nitrite and acetic acid to 3-amino-1,2,4-triazole (amitrole). Extraction was done with sulfur ether. The general formula can be assumed to be $C_2H_2N_4O_2$. The presence of a stable triazole ring was confirmed by mass spectrometry and IR spectrometry. The introduction of a nitro group into the electrically inactive amitrole molecule makes it amenable to polarographic determination.

76-1578. Shoyama, M.; Miyachi, Y.; Sakakibara, J. (Criminol. Lab., Aichi Prefect. Police Headquarters, Nagoya, Aichi, Japan). **[Colorimetric determination of organothiophosphorus pesticides with palladium chloride and *p*-nitroso *N,N*-diethylaniline.]** *Bunseki Kagaku (Jpn. Anal.)* 25(3): 179-182; 1976. (4 references) (Japanese)

Basic conditions for colorimetric determination of organothiophosphorus pesticides were studied and a standard method was established. Phencapton, dialifor, phosalone, and malathion were investigated by reaction with palladium chloride, extraction of the reactant with chloroform, and color development by addition of *p*-nitroso *N,N*-diethylaniline (NDA). The reaction was conducted in aqueous acetonic solution containing ammonium nitrate and palladium chloride with a constant pH maintained by adding buffer. The extinction coefficient was read at 521, 521, 521, and 516 nm, respectively, for the above compounds. The coefficients of variation for the determinations were 1.3, 3.3, 4.0, and 1.4%, respectively. It was suggested that aromatic amines, such as aniline and its derivatives, and α- and β-naphthylamine interfered with the method by developing intense color.

76-1579. Ono, S.; Hasegawa, J.; Yanase, R.; Sugioka, K.; Toyama, N. (Fine Chem. Res. Lab., Nippon Soda Co., Odawara, Kanagawa, Japan). **[Studies for pesticide residue analysis. Part 1. Residue analysis of thiophanate methyl and its degradation product by ultraviolet absorption spectrophotometry.]** *Bunseki Kagaku (Jpn. Anal.)* 24(12): 750-754; 1975. (3 references) (Japanese)

Residue analysis for thiophanate-methyl and its principal degradation product, 2-methyl benzimidazolyl carbamate (MBC, carbendazim) on/in various agricultural crops was studied. First, the active ingredient and MBC were extracted from the specimen with methanol and the extract was acidified with hydrochloric acid. Then, the active ingredient was extracted with dichloromethane. Separation of the two components was satisfactory. The separated active ingredient was cyclized to MBC by refluxing with copper acetate in 50% aqueous acetic acid. After cleanup, MBC was determined by UV absorption spectrophotometry. To avoid the interfering absorption due to plant components, the corrected absorbance method was adopted. The detection limits of thiophanate-methyl and MBC were 0.02 and 0.01 ppm, respectively, when 100 g specimen were analyzed.

76-1580. Chou, S. (Taiwan Provincial Hygienic Lab., Taiwan). **[The determination of a herbicide (propachlor) residue in radish.]** *Chung Kuo Nung Yeh Hua Hsueh Hui Chih (J. Chin. Agric. Chem. Soc.)* 11(3/4): 59-63; 1973. (1 reference) (Chinese)

The detection of propachlor in radish by the use of gas chromatography with electron capture detection is described. Benzene in a blender is used for sample extraction. The extract is evaporated to a small volume in a rotary evaporator under reduced pressure and dissolved in 10% benzene-*n*-hexane mixture. The sample is then passed through a column packed with silver nitrate-activated

alumina and eluted with 10% benzene-*n*-hexane mixture, followed by 25% benzene-*n*-hexane mixture. The latter is evaporated to about 1 ml. Four μl of this mixture is injected into the gas chromatograph. A sensitivity as low as 0.01 ppm may be obtained. The recovery of added herbicide is about 80%.

76-1581. Lopez Ibarra, R.; de la Fuenta, J. M. (Agric. Mar. Sci. Div., Tech. Inst., Monterrey, N. L., Mexico.) **Determinacion mediante bioensayo de residuos de insecticidas organicos usados en el control de plagas de maiz. [The bioassay of residues of organic insecticides used for the control of corn pests.]** *Folia Entomol. Mex.* (25-26): 117-118, 1973. (Spanish)

The presence of residue from six insecticides was investigated in spring and summer fields of Nuevo Leon U.S.-1 variety of corn. Carbaryl (2 kg/ha), endrin (0.45 kg/ha), DDT (2 kg/ha), diazinon (0.25 kg/ha), malathion (2.0 kg/ha), and methyl parathion (0.40 kg/ha), in solutions equivalent to 1001 water/ha, were sprayed in three applications on parcels of land containing five furrows 90 cm x 18 meters. The determinations were carried out on 20 corn plants taken at random from the middle furrows. Samples consisting of all the levels, the ears and their bracts, and 40 cm portions of stem taken at the level of the ears were collected in polyethylene bags and preserved by refrigeration. Extracts of each insecticide were then prepared and bioassayed as a function of previously determined standard curves based on mortality of *Drosophila melanogaster* M. The results indicated that residues of endrin and DDT were within the prescribed safety limits.

76-1582. Dutripon, E. (Author address not given). **Analyse rapide des carbaryl dans les pesticides. [Rapid analysis of carbaryl in pesticides.]** *Inf. Chim.* (149): 249-251; 1975. (2 references) (French)

Liquid chromatography is the only method capable of separating carbaryl from other pesticides and from impurities. A comparison of determinations shows, in liquid specimens for example, a 29.71% carbaryl concentration detected by liquid chromatography, 22.25% by infrared spectrophotometry, and 27.74% by colorimetry, with a theoretical composition of 27%. The utilization of 10 micron phases, micron Porasil or micron Waters' Bondapak, significantly increases sensitivity. The improvement of detection will be maximal if the use of small diameter columns is combined with greater injected volumes (150-250 microliters). The best limit of detection is obtained without a column; however, the best separation is obtained with the longest possible column. An efficient compromise can be arrived at by injecting a sample at a volume sufficiently large to be detected after dilution but sufficiently small to avoid decreasing resolution. The universal injector U6K (Waters) allows for injections of 1-2 microliters or more. It is highly appropriate and efficient in detecting traces of pesticides, insecticides, and fungicides, as well as their residues or metabolites. The combination of 10 microliter columns with the U6K universal injector increases the sensitivity from 20 to 60. It is thus possible to detect 0.01 to 0.05 nanograms of carbaryl.

76-1583. Ivey, M. C. (U. S. Livestock Insects Lab., Agric. Res. Serv., Dep. Agric., Kerrville, TX 78028). **Gas-liquid chromatographic determination of famphur and its oxygen analog in tissues of reindeer and cattle.** *J. Assoc. Off. Anal. Chem.* 59(2): 261-263; 1976. (2 references)

A gas chromatograph equipped with a flame photometric detector operating in the phosphorus mode provided a sensitive method for determining residues of famphur, *O,O*-dimethyl *O*- [*p*-(dimethylsulfamoyl) phenyl]- phosphorothioate, and its oxygen analog in reindeer and cattle tissues. With extraction and cleanup, 0.025 ppm famphur and 0.06 ppm oxygen analog could be detected in the body tissues. Recoveries of 73-100% were obtained from fat, muscle, liver, and kidney. (Author abstract by permission)

76-1584. Pik, A. J.; Hodgson, G. W. (Environ. Sci. Cent. (Kananaskis), Univ. Calgary, Calgary, Alberta, Canada). **Gas-liquid chromatographic determination of 3,6-dichloropicolinic acid in soils.** *J. Assoc. Off. Anal. Chem.* 59(2): 264-268; 1976. (15 references)

A gas-liquid chromatographic (GLC) method has been developed for the determination of the experimental herbicide 3,6-dichloropicolinic acid (Dowco 290) in soils. The method involves extraction of 1 g soil samples with 1*N* NaCl at approximately pH 7, methylation with diazomethane utilizing a microgenerator, and detection by electron capture GLC. Interferences are small, so that a cleanup step is not necessary even at the 6 ppb level. The procedure is rapid, requiring only 45 min/sample. Recoveries range from 84 to 94% at the 6-1000 ppb level with a minimum detectable limit of 6 ppb. Standard deviations for the percentage recovery values vary from 10.9 to 2.3 for the tested range of 6.7-670 ppb, respectively. (Author abstract by permission)

76-1585. Betker, W. R.; Smead, C. F.; Evans, R. T. (Chemagro Agric. Div., Mobay Chem. Corp., Kansas City, MO 64120). **Comparison of analysis methods for metribuzin.** *J. Assoc. Off. Anal. Chem.* 59(2): 278-283; 1976. (2 references)

Determinations of the active ingredient in technical and formulated metribuzin were compared by gas-liquid chromatography (GLC) using various solvents, infrared (IR) spectrophotometry, and high-pressure liquid chromatography (HPLC). Ketones could not be used as a solvent for GLC analysis because of Schiff base formation. The GLC method using ethylene glycol monomethyl ether gave results about 1% higher for technical metribuzin than the other methods. GLC using methylene chloride solvent agreed with IR and HPLC results to within 0.4%. GLC using methylene chloride is the preferred method. (Author abstract by permission)

76-1586. Ramsteiner, K. A.; Hoermann, W. D. (CIBA-Geigy Ltd., Agrochem. Div., Basel, Switzerland). **Coupling high-pressure liquid chromatography with a cholinesterase inhibition AutoAnalyzer for the determination of organophosphate and carbamate insecticide residues.** *J. Chromatogr.* 104:438-442; 1975. (8 references)

This paper presents the possibility of coupling a liquid chromatograph with an AutoAnalyzer system sensitive to cholinesterase-inhibiting compounds along with some preliminary results obtained with this combination. The system was checked with different compounds including four organophosphates, CGA 17809, phosphamidon, monocrotophos, and dicrotophos, and two carbamates, dioxacarb and dimetilan. This method of analysis is highly specific. First, only cholinesterase-inhibiting compounds are detected. Second, compounds are separated according to their retention times on the liquid chromatographic column used. The combination increases the validity and specificity of the former Auto-Ananlyzer cholinesterase inhibitor method. The limit of detection of CGA 18809 was 20 ng. Limits of detection for the other compounds ranged from 10 pg (diazoxon) to 200 pg (dioxacarb). These limits are usually acceptable considering that no interferences occur from non-cholinesterase-inhibiting co-extractives. This method has advantages over existing methods for determining carbamate residues in that no preliminary hydrolysis and/or derivatization are needed.

76-1587. Gauntley, P.; Magadur, J. L.; Morel, G.; Chaumont, P.; Canel, F. (Inst. Nat. Rech. Secur., Cent. Rech. Vandouvre, Serv. Chim. Toxicol., Vandoeuvre-les-Nancy, France). **Dosage de l'hexachlorobutadiene dans les milieux biologiques. [Determination of hexachlorobutadiene in biological mileux.]** *J. Eur. Toxicol.* 8(3): 152-158; 1975. (8 references) (French)

Determination of hexachlorobutadiene by the Fujiwara method consists of the extraction and sulfuric acid digestion of hexachlorobutadiene in heptane. Following a 15 sec agitation, 10 min heating at 70°C, cooling, and a 15 sec agitation, 1 ml from each sample was centrifuged for 3 min., and the optical density was read at 436 nm after a 10 min wait. Nine chlorinated solvents were also subjected to the method. Of all the absorption spectra, only that of hexachlorobutadiene appeared at 440 nm. While the order of introduction of the reactancts is unimportant, the 440 nm peak will not appear in the absence of alcohol. With the second method, UV spectrophotometry, the absorption spectrum of hexachlorobutadiene purified in heptane falls at about 220 nm. Because of the non-specificity of UV spectrophotometry, the non-interference of other substances must be verified. Sensitivities of 5 ppm for the colorimetric method and 0.05 ppm for the spectroscopic method were reached in blood and urine. For each biological milieu studied, malathion values of 0.999 were found for exhaled air (heptane), 0.998 for blood, and 0.994 for the bile.

76-1588. Potti, E. E.; Kaimal, P. M.; Nair, P. G. (Forensic Sci. Lab., Trivandrum-11, Kerala State, India). **Detection and identification of mixed benzoic dialkyl phosphorodithioic anhydride pesticides by thin layer chromatography.** *J. Forensic Sci. Soc.* 15(4): 309-311; 1975. (8 references)

A novel thin-layer chromatographic method was developed for the easy detection and identification of benzoic dialkyl phosphorodiothioic anhydrides in pesticide formulations. Thin-layer chromatograms of the suspected pesticide are run alone and in the presence of aniline. Aniline rapidly reacts with a mixed anhydride to form benzanilide and the respective diethyl phosphorodithioic acid. The liberated diethyl phosphorodithioic acid is retained as the aniline salt at the base spot in the chromatogram. None of the ester pesticides (e.g., parathion, malathion, diazinon) incorporated with the anhydride undergo any reaction with aniline. The chromatograms are developed using a mixture of *n*-hexane, acetone, and methanol, after which the dried plate is sprayed with 1% fluorescein in alcohol. The anhydrides give distinct bright brown spots in UV light. Since the ester pesticides retain their identity during the reaction, they can easily be located by their characteristic *Rf* values.

76-1589. Paal, T.; Bago-Szmodits, G. (CHINOIN Pharm. Chem. Co., Budapest, Hungary). **A benomyl novenyvedo szer szelektiv, kemiai meghatarozasa. [Selective chemical determination of the plant protecting agent benomyl.]** *Magy. Kem. Foly.* 82(1): 27-30; 1976. (Hungarian)

A new selective and specific method for the rapid determination of benomyl in technical preparations and in Fundazol 50% is described. The method is based upon the reaction of the weakly bound butyl carbamoyl group with aliphatic amines (*n*-butylamine, piperidine, L-ephedrine, 2-methylpiperidine and di(*n*-butyl)amine) to yield 2-benzimidazole carbamate and the corresponding substituted ureas. Upon dissolution in a mixture of dioxane and the amine reagent, benomyl is determined in its technical preparations through titration of the excess amine with hydrochloric acid. The reaction time is 1-2 min at 70°C. The statistical error amounted to + 0.5% for benomyl and to + 0.8% for Fundazol. No systematic error was observed.

76-1590. Anonymous. **Mesures de la teneur en pesticides dans les produits alimentaires. [Measure of pesticide content in food products.]** *Mesures* 41(1-2): 31-32; 1976. (French)

For the analysis of pesticides in food products the Philips laboratories utilize a system consisting of 4 modules which successively provide preliminary treatment, separation, detection, and determination of the fatty acids. For milk, the process begins with treatment of the milk in diluted sulfuric acid in order to separate the fatty substance containing the pesticides. The fat and its impurities then undergo hexane extraction; the hexane extract is dried on a column and residual acid removed. A sample of

the refined product is injected onto the auxiliary column of the separator module where the fat is separated from the pesticides with *n*-hexane. The pesticides are separated into two groups, the first being fed into an analytical column and the second being completely decomposed and passed onto the ECD gas chromatograph. The first group follows shortly. A refractometer determines the fat concentration of the solution obzained. The treatment of the results and the control of the entire system are performed with a micro-ordinator.

76-1591. Webb, R. G.; Garrison, A. W.; Keith, L. H.; McGuire, JI M. (EPA, Southeast Environ. Res. Lab., Athens, GA). **Current practice in GC-MS analysis of organics in water.** *Natl. Tech. Inform. Serv.* PB 224, 947/2, 1973, 94 p. (25 references)

The application of gas chromatography—mass spectrometry (GC-MS) to the analysis of wastewater was studied for a period of 5 yrs. This report presents recommended practices for the applications of these analytical methods. It was found that liquid-liquid extraction with solvents such as methylene chloride and chloroform removed more than 50% of the compounds found in pulp mill and petrochemical waste at concentrations of 2 μg/l to 20 μg/l. The most effective means of concentration after extraction was the Kuderna-Danish evaporator. Of the five methylation reagents studied diazomethane and dimethyl sulfate were the most effective. Packed columns were effective for gas chromatography of simple mixtures. SCOT columns provided better overall performance for complex mixtures. For practical use of GC-MS on samples containing many compounds, computerized data reduction was essential. A computerized spectra matching program was highly effective in identifying compounds contained in the computer library. The system designed in this study is effective for solving problems related to fishkills caused by pesticides, confirming polychlorinated biphenyl residues in water, and identifyi ng compounds discharged by over a dozen industries.

See also **76-1393** **76-1405** **76-1478**

76-1592. Anonymous. (Mitre Corp., Washington Operation, McLean, VA). **Compendium of analytical methods. Vol. I., Matrix of methods.** *Natl. Tech. Inform. Serv.* PB 228, 424, 1973, 104 p. (38 references)

In this compendium some 400 methods which are currently in use, or were in recent use, for the analysis of pollutants in various media are described. Important characteristics of each method are given in the form of a one page summary. Methods are also summarized in a matrix which presents: pollutant analyzed, medium in which it occurs, and non-quantitative descriptions of the measurement/detection method. Methods have been categorized for the following: air, water and wastewater, drinking water supply, solid waste, radioactivity, pesticides, oils and grease, and biological methods. This volume also contains a list of primary reference sources.

76-1593. Sato, N. (Nippon Soda Co., Ltd., Tokyo, Japan). [**Benzomate (citrazon).**] *Noyaku Kagaku (J. Pestic. Sci.)* 3(3): 123-131; 1976. (16 references) (Japanese)

General characteristics of a recently developed agricultural and horticultural acaricide, benzomate, ethyl *O*-benzoyl 3-chloro-2,6- dimethoxybenzohydroximate, are presented. Determination of the commercial product, 20% EC, is by extraction with ethyl acetate plus *n*-hexane, followed by cleanup with silica gel chromatography. The extinction coefficient is read at 285 nm. LD 50, p.o. and i.g. in experimental animals is greater than 12 g/kg. The maximal no-effect chronic dose is 236.1 and 20.6 mg/kg/day, respectively, in mouse and rat. No teratogenic effect was observed at the maximal dose of 500 mg/kg/day in mouse. At the maximal dose of 90 mg/kg/day in rats, no effects were observed in progeny. Residues in milk, meat, and organs were lower than detection limits (3 ppm in daily diet or 80 mg/kg/day in cow and rat). TLm (48 hr) for carp is 0.44 ppm (the fish toxicity is thus relatively high). One day after application, the residues in citrus peel, citrus edible parts, and apple were 1.2 ppm, undetectable and 0.108 ppm respectively. Metabolism of benzomate in animals and plants was described. Residues in soil should not present major problems according to experimental data from a soil model.

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other compound designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

Alternative controls
Analysis
Beneficial effects
Biochemical effects (*see also* Enzyme activity)
Blood/body fluids
Carcinogenesis
Cardiovascular system
Cytological effects
Digestive system
Economics
Endocrine system (*see also* Reproduction/growth)
Environmental pollution
Enzyme activity (*see also* Biochemical effects)
Excretory system
Experimental design
Factors influencing metabolism/toxicity
Immunology
Integumentary system
Laws and regulations
Metabolism (*see also* Residue degradation)
Morbidity and mortality statistics
Musculoskeletal system
Mutagenesis/teratogenesis (*see also* Cytological effects)
Nervous system
Nomenclature
Photodecomposition (*see also* Residue degradation)
Poison control centers
Prevention
Reproduction/growth (*see also* Endocrine system)
Residue degradation (*see also* Photodecomposition *and* Metabolism)
Residue dynamics
Residue removal
Residues/air
Residues/non-target organisms
Residues/food and feed
Residues/human
Residues/plants
Residues/soil
Residues/water
Respiratory system
Reticuloendothelial system
Reviews
Safety standards
Sensory system
Therapeutic use
Toxicity/non-target organisms
Toxicity/experimental animals
Toxicity/humans
Treatment of poisoning

Subject Index: Concepts

Absorption
see also Metabolism
Fish
PCP, 76-1279
Fungi
Methoxychlor, 76-1204
Plankton/algae
Methoxychlor, 76-1204
Plants, 76-0860
Rat
Dieldrin, 76-1231
Hexachlorobenzene, 76-1231

Adrenal
see also Endocrine system
Animals/experimental
TDE, 76-1022, 76-1517
Human
TDE, 76-0991

Alimentary tract
see also Digestive system
Animals/experimental
Propoxur, 76-1487

Alternative controls, 76-1091, 76-1097 76-1102, 76-1104, 76-1105 76-1352, 76-1357
Juvenile hormones and analogs 76-1349

Amino acids/peptides/proteins
see also Biochemical effects
Animals/experimental, 76-0919
Amitrole, 76-1249
Dichlorvos, 76-1485
Dioxins, 76-0959
NS 2662, 76-1485
2,4,5-T, 76-1238
TDE, 76-1022
Trichlorfon, 76-1485
Human
DDT, 76-1020
Lindane, 76-1020
In vitro
DDT, 76-1497
DFP, 76-0955
Dioxins, 76-0958
Mercurials, 76-0955, 76-1207
Rotenone, 76-0944
Warfarin, 76-1459
Microorganisms
Lindane, 76-1309
Trifluralin, 76-0935

Analysis
see also Bioassay; Chromatography; Electrometry; Enzyme assay; Spectrometry; Titration
General, 76-1058, 76-1059, 76-1076 76-1078, 76-1079, 76-1317
Organochlorines, 76-1080
Organophosphates, 76-1080
Experimental design
Organochlorines, 76-1088
Reviews, 76-1058, 76-1059, 76-1070

Analysis (cont'd)
Reviews, 76-1078, 76-1592
Organophosphates, 76-1570
Trichlorfon, 76-1570
Sample preparation, 76-1590
DDE, 76-1069
DDT isomers, 76-1069
Dieldrin, 76-1069
Endrin, 76-1069
Methabenzthiazuron, 76-1322
Organochlorines, 76-1064 76-1088, 76-1575
Organophosphates, 76-1064 76-1328, 76-1575
Polychlorinated biphenyls 76-1064

Balance
see also Sensory system
Human
Organophosphates, 76-1429

Behavior
see also Nervous system
Animals/experimental
Armine, 76-1506
Carbaryl, 76-1270
DDE, 76-1545
DDT, 76-1024, 76-1545
Industrial, 76-1270
Paraoxon, 76-1263

Beneficial effects, 76-0840, 76-1099 76-1100

Bile
see also Blood/body fluids
Animals/experimental
Mirex, 76-0965
Polychlorinated biphenyls 76-0965

Bioassay
see also Analysis
Atrazine, 76-1087
Carbaryl, 76-1581
DDT, 76-1581
Diazinon, 76-1581
Diuron, 76-1087
Endrin, 76-1331, 76-1581
Herbicides, 76-1568
Linuron, 76-1087
Malathion, 76-1581
Methyl parathion, 76-1581
Simazine, 76-1087

Biochemical effects
see also Amino acids/peptides/proteins; Carbohydrates; Catecholamines; Electrolytes; Enzyme activity; Lipids/steroids/sterols; Nucleic acids; Porphyrins; Respiration, cellular; Vitamins/coenzymes
General, 76-1479
Ronnel, 76-1308

Biotransformation
see also Metabolism 76-1477
General, 76-0933, 76-1003, 76-1479
Fenitrothion derived compounds 76-1232
Herbicides, 76-1268
Organochlorines, 76-1268
Organophosphates, 76-1513
Birds
3-Chloro-*p*-toluidine, 76-0962
Crustacea
Parathion, 76-1507
Fish
PCP, 76-1280
Fungi
1-Naphthol, 76-1026
Simazine, 76-1186
In vitro
Biphenyl, 76-0934
Carbaryl, 76-1478
Cisanilide, 76-1014
Diazinon, 76-1282
Organophosphates, 76-1533
Parathion, 76-1507
Insects
Carbaryl, 76-1209
Chlordimeform, 76-1248
DDT derived compounds 76-1505
Piperonyl butoxide, 76-1248
Propoxur, 76-1209
Pyrethrins, 76-1474
Microorganisms
Atrazine, 76-1133
Bromoxynil, 76-1218
Carbaryl, 76-0943
Carbofuran, 76-1490
2,4-D, 76-1189
DDT, 76-1000
Di-allate, 76-1475
Dieldrin, 76-1299
Herbicides, 76-0907, 76-1561
Ioxynil, 76-1218
Juvenile hormones and analogs 76-1299
Lindane, 76-0926, 76-1537
M15, 76-1189
Methyl parathion, 76-1122
Organochlorines, 76-0907
Organophosphates, 76-0907
Parathion, 76-0925, 76-1156
Propoxur, 76-0943
Simazine, 76-1186
Toxaphene, 76-1027
Trifluralin, 76-0897
Monkey
Aldrin, 76-0945
Isodrin, 76-0945
Mirex, 76-1488
Mouse
Endrin, 76-1032
Methoxychlor, 76-1505
Parathion, 76-1507

Biotransformation (cont'd)
Pyrethrins, 76-1474
Plankton/algae
Lindane, 76-1150
Parathion, 76-1156
Plants
Chloroneb, 76-1284
2,4-D, 76-1283, 76-1509
EPTC, 76-1243
Ethephon, 76-1245
Phenamiphos, 76-1289
Phorate, 76-1243
Picloram, 76-1283
Propham, 76-1012
Pseudomonas fragi
Fenaminosulf, 76-1011
Rat
Aldrin, 76-0945
DDE, 76-0920
DDT, 76-0920
Dichlone, 76-0921
Dichloran, 76-1033
Dioxins, 76-0969
Ethylene thiourea, 76-1030
Isodrin, 76-0945
Parathion, 76-1196
Permethrin, 76-1240
Pyrethrins, 76-1474
Sheep
2,4-D, 76-1189

Blood/body fluids
see also Bile; Plasma/serum
Animals/experimental
Phthalide, 76-1278
2,4,5-T, 76-1265
Thiometon, 76-1548

Blood vessels
see also Cardiovascular system
Animals/experimental
Dichlorvos, 76-1210
Fenitrothion, 76-1210

Brain
see also Nervous system
Animals/experimental
Dichlorvos, 76-1034
Dieldrin, 76-1549
Disulfoton, 76-1466

Carbohydrates
see also Biochemical effects
Animals/experimental
DDT, 76-0970
Plants
2,4-D, 76-1285

Carcinogenesis
Animals/experimental, 76-1527
Human, 76-1504
Bordeaux mixture, 76-1435
Dichlorvos, 76-1438, 76-1438
Herbicides, 76-1185, 76-1442
Lindane, 76-1438
Organochlorines, 76-1442

Cardiovascular system
see Heart

Catecholamines
see also Biochemical effects
Animals/experimental
Disulfoton, 76-1466

Chromatography
see also Analysis
General
Carbamates, 76-1056
Herbicides, 76-1568
Organochlorines, 76-1056
Organophosphates, 76-1056
Column, 76-1061, 76-1311
Carbamates, 76-1586
Carbaryl, 76-1582
Fungicides, 76-1060
Herbicides, 76-1314
Malathion, 76-1068
Metribuzin, 76-1585
Organochlorines, 76-1333
Organophosphates, 76-1586
Gas-liquid, 76-1049, 76-1070
76-1071, 76-1590, 76-1591
Aldrin, 76-1073, 76-1325
Benthiocarb, 76-1336
BHC, 76-1325
Butylate, 76-1067
Captan, 76-1336
Carbamates, 76-1065, 76-1084
76-1085, 76-1086, 76-1339
2,4-D, 76-1048
2,4-D derived compounds
76-1048
DDE, 76-1062, 76-1325, 76-1334
DDT, 76-1325, 76-1334, 76-1567
DDT isomers, 76-1062
3,6-Dichloropicolinic acid
76-1584
Dicryl, 76-1055
Dieldrin, 76-1062, 76-1073
76-1325, 76-1334
Dioxins, 76-1083
Diuron, 76-1072
EPTC, 76-1067
Famphur, 76-1583
Fenitrothion, 76-1329
Folpet, 76-1336
Fungicides, 76-1046
Heptachlor epoxide, 76-1062
76-1325
Herbicides, 76-1057, 76-1077
Lindane, 76-1062
Linuron, 76-1072
Metaldehyde, 76-1054
Metoxuron, 76-1072
Metribuzin, 76-1585
Organochlorines, 76-1064
76-1077, 76-1573, 76-1575
Organophosphates, 76-1064
76-1077, 76-1315, 76-1319
76-1326, 76-1575
Oxamyl, 76-1320
Paraquat, 76-1052
Parathion, 76-1051, 76-1062
Phenproxide, 76-1335
Polychlorinated biphenyls
76-1064
Propachlor, 76-1580

Chromatography (cont'd)
Propanil, 76-1055
Squoxin, 76-1576
TDE, 76-1325, 76-1334
Thiabendazole, 76-1074
Triazines, 76-1047
Gel permeation
Benzomate, 76-1593
DDT, 76-1565
Heptachlor, 76-1565
Lindane, 76-1565
Thin-layer, 76-1310
Benomyl, 76-1405
BHC isomers, 76-1342
Carbendazim, 76-1405
DAEP, 76-1343
DDT isomers, 76-1342
DNOC, 76-1327
Endrin, 76-1316
Metobromuron, 76-1393
Organochlorines, 76-1082
Organophosphates, 76-1082
76-1564, 76-1569, 76-1588
Picloram, 76-1330

Chromosomes/genes
see also Cytological effects
In vitro
Azinphosmethyl, 76-1501
Carbamates, 76-1216
Fungicides, 76-1216
Herbicides, 76-1216
Organochlorines, 76-1216
Plants
Dichlorvos, 76-0988

Cytological effects
see also Chromosomes/genes; Endoplasmic reticulum; Golgi apparatus; Microsomes; Mitochondria; Mitosis/meiosis
Animals/experimental
Dichlorvos, 76-1274
Dieldrin, 76-1549
Mirex, 76-1514
Paraquat, 76-1458
Soman, 76-1457
In vitro
DFP, 76-0990
Herbicides, 76-1214
Organophosphates, 76-0971
Thiabendazole, 76-0973
Plants
Carboxin, 76-1212
Oxycarboxin, 76-1212

Digestive glands
see also Digestive system
Animals/experimental
DEF, 76-0952

Digestive system
see also Alimentary tract; Digestive glands; Liver; Pancreas (exocrine)
Animals/experimental
Fenitrothion, 76-1502
Malathion, 76-1502
Parathion, 76-1502

Digestive system (cont'd)
Trichlorfon, 76-1304
Human
Paraquat, 76-1427, 76-1433

Distribution/storage
see also Metabolism
Birds
3-Chloro-*p*-toluidine, 76-0962
Cow
DDE, 76-1246, 76-1251
DDT, 76-1246
Diphacinone, 76-1239
Hexachlorobenzene, 76-1251
TDE, 76-1246
Crustacea
Dieldrin, 76-1009
Fish
DDE, 76-0942
DDT, 76-0942
Dieldrin, 76-0942
PCP, 76-1280
TDE, 76-0942
Guinea pig
Ethylene dibromide, 76-1296
Human
BHC, 76-1143
DDT, 76-1143
Diazinon, 76-1168
Paraquat, 76-0904
In vitro
Diquat, 76-1480
Paraquat, 76-1480
Insects
Chlordimeform, 76-1248
Piperonyl butoxide, 76-1248
Microorganisms
Organochlorines, 76-1448
Molluscs
DDT, 76-1008
Dieldrin, 76-1008, 76-1009
Polychlorinated biphenyls 76-1008
TDE, 76-1008
Monkey
Dioxins, 76-1521
Mouse
Cartap, 76-1446
DDT, 76-0929
Dieldrin, 76-0929
Plants
DDT, 76-1523
Rabbit
Hexachlorobenzene, 76-1228
Rat
Carbaryl, 76-0939, 76-0960
DDE, 76-1536
DDT, 76-1036
Dieldrin, 76-1231
Dioxins, 76-0969, 76-1521
Hexachlorobenzene, 76-1231
Methiocarb, 76-0939
Mexacarbate, 76-0939
Mirex, 76-1520
PCP, 76-1205
Ro-neet, 76-0985
2,4,5-T, 76-0957
Sheep

Distribution/storage (cont'd)
Ronnel, 76-1555

Economics, 76-0841, 76-0849, 76-1092
Herbicides, 76-1345

EEG
see also Nervous system
Animals/experimental, 76-1471
Dichlorvos, 76-1275
Human
Organochlorines, 76-1276
Organophosphates, 76-1276 76-1425
Sarin, 76-1166

Eggshell, effects
see also Reproduction/growth
Animals/experimental
DDE, 76-1247, 76-1272, 76-1544
Polychlorinated biphenyls 76-1544
Animals/non-target
DDE, 76-0917
Dieldrin, 76-0917
Polychlorinated biphenyls 76-0917

Electrolytes
see also Biochemical effects
Animals/experimental
DDE, 76-1272
In vitro
Organochlorines, 76-0983
Strychnine, 76-1199

Electrometry
see also Analysis
Conductometry
Carbamates, 76-1318
Herbicides, 76-1318
Organochlorines, 76-1318
Organophosphates, 76-1318
Polarography
Lindane, 76-1574
Thallium, 76-1050

Embryo/fetus
see also Reproduction/growth
Animals/experimental
Carbamates, 76-1482
Carbaryl, 76-0960
2,4-D, 76-1017
DDT, 76-1045
DFP, 76-1037
Dichlorvos, 76-1037
EPTC, 76-0951
Fenitrothion, 76-1489
Methabenzthiazuron, 76-1468
Metoxuron, 76-1468
Molinate, 76-0951
Monocrotophos, 76-1500
Organophosphates, 76-1482
Polychlorinated biphenyls 76-1017
Pyrazon, 76-1468
Simazine, 76-1494
2,4,5-T, 76-1494
In vitro
DDT, 76-1493

Endocrine system
see also Adrenal; Gonads; Thymus
Animals/experimental
Amitrole, 76-1271

Endoplasmic reticulum
see also Cytological effects
Animals/experimental
Dioxins, 76-0940

Environmental pollution, 76-0840 76-0843, 76-0847, 76-1092 76-1103, 76-1106, 76-1346 76-1348, 76-1353, 76-1355 76-1356
Chlordecone, 76-1093
DDT, 76-0848
Fungicides, 76-0846
Herbicides, 76-0846, 76-1345
Lead, 76-1350
Mercurials, 76-0848
Organochlorines, 76-0846, 76-1347
Organophosphates, 76-0846
Polychlorinated biphenyls, 76-1351

Enzyme activity
see also Biochemical effects
General
Amitrole, 76-1249
Copper sulfate, 76-1178
DDT, 76-1036, 76-1038
DEF, 76-0952
Dioxins, 76-0969
Fenaminosulf, 76-0989
Fenitrothion, 76-1502
Lindane, 76-1287, 76-1492
Malathion, 76-1502
Organophosphates, 76-1178 76-1422
Parathion, 76-1502
Phthalide, 76-1278
Ronnel, 76-1308
Thiometon, 76-1548
Adenylate cyclase
Plictran, 76-1211
Aldehyde dehydrogenase
Dioxins, 76-0959
Aliesterase
Parathion, 76-1223
Alkaline phosphatase
Diazinon, 76-1229
Aryl hydrocarbon hyproxylase
Dioxins, 76-0958
ATPase
2,4-D, 76-0953
DDE, 76-1272
Diazinon, 76-1229
Paraoxon, 76-1483
Parathion, 76-1483
Plictran, 76-1211
Cholinesterase, 76-0981, 76-1471
Armine, 76-1202
Crufomate, 76-1023
DFP, 76-1037, 76-1512
Dichlorvos, 76-1034, 76-1037 76-1275, 76-1277, 76-1532
Dicrotophos, 76-0924
Dimethoate, 76-1524, 76-1535
Fenitrothion, 76-0950

Enzyme activity (cont'd)
Leptophos, 76-0950
Malathion, 76-0924, 76-1512 76-1539
Methyl parathion, 76-1524
Mipafox, 76-0950
Organophosphates, 76-1198 76-1425, 76-1534
Paraoxon, 76-0937, 76-0980 76-1197, 76-1260, 76-1263
Parathion, 76-1222, 76-1223 76-1460, 76-1512
Phenthoate, 76-1524
Phosphamidon, 76-1512
Propoxur, 76-1487
Toxaphene, 76-1484
Trichlorfon, 76-1535
Esterases
Butacarb, 76-1481
Organophosphates, 76-0971 76-1529
Glutathione peroxidase, 76-0972
Glucose-6-phosphate dehydrogenase
DDT, 76-0987
Lindane, 76-0987
Toxaphene, 76-0987
Glutathione reductase
Paraquat, 76-0972
GOT
Hexachlorobenzene, 76-0968
Trichloroethylene, 76-0968
GSH, 76-1510
GOT
Polychlorinated biphenyls 76-0968
Lactic dehydrogenase, 76-1237
Lipase
Trichlorfon, 76-1304
Mixed function oxidases, 76-0982
Cisanilide, 76-1014
DDE, 76-1472
DDT, 76-0966, 76-1472, 76-1503 76-1503
Dioxins, 76-0940, 76-0978
Hexachlorobenzene, 76-0968
Lindane, 76-0927
Malathion, 76-1235
Methyl parathion, 76-1469
Parathion, 76-1196
Polychlorinated biphenyls 76-0968, 76-1503
Synergists, 76-1221
Trichloroethylene, 76-0968
Zineb, 76-1469
Neurotoxic esterase
Organophosphates, 76-1191
Ornithine decarboxylase
Carbon tetrachloride, 76-0967
DDT isomers, 76-0967
Phosphodiesterase
DFP, 76-0990
Proteinases, 76-0954
Renal hydrolase
DFP, 76-0955
Mercurials, 76-0955
Ribonuclease
EPTC, 76-0951

Enzyme activity (cont'd)
Molinate, 76-0951
Succinic dehydrogenase
Diazinon, 76-1229
Leptophos, 76-1203
Superoxide dismutase
Paraquat, 76-0972
Transketolase
2,4-D, 76-0953
Urokinase
DFP, 76-0956

Enzyme assay
see also Analysis
General
Organophosphates, 76-1569
Cholinesterase, 76-1075, 76-1310 76-1566
Carbamates, 76-1586
Organophosphates, 76-1586

Excretion
see also Metabolism
Cow
DDE, 76-1251
Hexachlorobenzene, 76-1251
Ronnel, 76-1555
Fish
PCP, 76-1005, 76-1279
Human
Organochlorines, 76-1437
Monkey
Mirex derived compound, 76-1488
Mouse
BHC isomers, 76-1025
Rat
Carbaryl, 76-0960
Mirex, 76-0965
Polychlorinated biphenyls 76-0965
2,4,5-T, 76-1519

Excretory system
see also Kidney
Animals/experimental
Dichlorvos, 76-1210
Fenitrothion, 76-1210
Human
Paraquat, 76-1433

Experimental design
General, 76-1095
Analysis
Organochlorines, 76-1088
Monitoring and residues, 76-0874 76-0891
DDT isomers, 76-1364, 76-1365
Toxicology and pharmacology 76-1301, 76-1559
Carbamates, 76-1216
Fungicides, 76-1216
Herbicides, 76-1216
Organochlorines, 76-1216
PCP, 76-1206
Warfarin, 76-1459

Factors influencing metabolism/toxicity
General
Herbicides, 76-0932
Adaptation

Factors influencing metabolism/toxicity (cont'd)
Amitrole, 76-1220
DDT, 76-1462
Lindane, 76-0927, 76-1462
Malathion, 76-1539
Organophosphates, 76-1462
Parathion, 76-1222, 76-1223
Piperonyl butoxide, 76-1220
Polyoxin A, 76-1540
Polyoxin B, 76-1540
Propoxur, 76-1209
Pyrethrins, 76-1462
Rotenone, 76-1462
Age
DFP, 76-1037
Dichlorvos, 76-1037
Dioxins, 76-1521
Thio-tepa, 76-1515
Biological magnification, 76-1139
Dieldrin, 76-1009
Organochlorines, 76-1029 76-1491
Organophosphates, 76-1491
Disease state
Hempa, 76-1187
Formulation
Arsenicals, 76-1511
Hexachlorobenzene, 76-0930
Humidity
Chlorfenvinphos, 76-1461
Oxinothiophos, 76-1461
Toxaphene, 76-1461
Interactions
Amitrole, 76-1249
Animals/experimental, 76-1473
Atropine, 76-0931
Cadmium, 76-1558
Carbaryl, 76-0938, 76-1043
Carbofuran, 76-1190
Carbon tetrachloride, 76-0967
Chlordimeform, 76-1248
Chlorfenvinphos, 76-1190
DDT, 76-0947, 76-1020
DDT isomers, 76-0967, 76-1558
Dichlone, 76-0921
Endothall, 76-0999
Ethephon, 76-0999
Fensulfothion, 76-1190
Hexachlorobenzene, 76-0968
Isophenphos, 76-1190
Lindane, 76-0947, 76-1020 76-1020
Malathion, 76-0947
Mevinphos, 76-0931
Mirex, 76-0965
Nitrofen, 76-1190
Paraquat, 76-0972
Parathion, 76-1043
PCP, 76-0947
Phorate, 76-1243
Piperonyl butoxide, 76-1248 76-1518
Polychlorinated biphenyls 76-0965, 76-0968, 76-1473
Propachlor, 76-1190
Pyrethrum, 76-0947

Factors influencing metabolism/toxicity (cont'd)
Rotenone, 76-0944
Sarin, 76-0918
Simazine, 76-1186
Soman, 76-0948
2,4,5-T, 76-0957
Trichloroethylene, 76-0968
Trifluralin, 76-1190
3-Chloro-*p*-toluidine, 76-0962
Nutritional state
2,4-D, 76-1509
DDE, 76-1536
Lindane, 76-1537
pH
Pyrethrins, 76-1476
Resmethrin, 76-1292
Pregnancy, 76-0982
Carbaryl, 76-0939, 76-0960
Dioxins, 76-0969
Ethylene thiourea, 76-1030
Methiocarb, 76-0939
Mexacarbate, 76-0939
Resmethrin, 76-0998
Sex, 76-0982
Fenitrothion, 76-0974
Methyl parathion, 76-0974
Thio-tepa, 76-1515
Structure/function
Organophosphates, 76-1541 76-1542
Taxon
Carbofuran derived compound 76-1010
Dioxins, 76-1521
Endrin, 76-1032
Herbicides, 76-1470
Monocrotophos, 76-1499
Organochlorines, 76-1470
Organophosphates, 76-1470
Parathion, 76-1507
PCP, 76-1259
Sodium chloride, 76-1259
Temperature
DDT, 76-1462
DNOC, 76-1553
Lindane, 76-1462
Methyl parathion, 76-1553
Organochlorines, 76-0910
Organophosphates, 76-1462 76-1513
Pyrethrins, 76-1462, 76-1476
Resmethrin, 76-1292
Rotenone, 76-1462

Fenitrothion
Vision
Animals/experimental, 76-1273

Fertility/sterility
see also Reproduction/growth
Animals/experimental
Dichlorvos, 76-0923, 76-1467
EPTC, 76-0951
Ferbam, 76-1035
Malathion, 76-1467
Molinate, 76-0951
Thiram, 76-1035

Gametogen
see Reproduction/growth

Golgi apparatus
see also Cytological effects
In vitro
DDT isomers, 76-1496
Dieldrin, 76-1496
Lindane, 76-1496

Gonads
see also Endocrine system
Animals/experimental
EPTC, 76-0951
Herbicides, 76-1470
MCPA, 76-1525
Molinate, 76-0951
Organochlorines, 76-1470
Organophosphates, 76-1470
Prometryne, 76-1525
Trichloropropionitrile, 76-1525
In vitro
Simazine, 76-1494
2,4,5-T, 76-1494

Growth
see also Reproduction/growth
Animals/experimental
Amitrole, 76-1249
Benomyl, 76-1281
Carbaryl, 76-1269
Ferbam, 76-1035
Industrial, 76-1269
Organochlorines, 76-1305 76-1305
Thiram, 76-1035
Animals/non-target
Difluron, 76-1291
Microorganisms
Captan, 76-1007
Carbaryl, 76-1464
Chlordane, 76-1257
Chlorpropham, 76-1225
2,4-D, 76-1215
DDT, 76-1215, 76-1257, 76-1464
Dichlobenil, 76-1556
Dichloran, 76-1007
Dieldrin, 76-1257
Dimethoate, 76-1464
Dinoseb acetate, 76-1288
Diquat, 76-1556
Disulfoton, 76-1224
Diuron, 76-1556
Drazoxolon, 76-1007
Endrin, 76-1257
Heptachlor, 76-1257
Lindane, 76-1495
Malathion, 76-1215, 76-1306 76-1464
Menazon, 76-1464
Rotenone, 76-1215
Simazine, 76-1186
2,4,5-T, 76-1215
Triarimol, 76-1007

Hearing
see also Sensory system
Animals/experimental
Paraquat, 76-1557

Heart
see also Cardiovascular system
Animals/experimental
BHC, 76-1226
DDT, 76-1226
Dichlorvos, 76-1275
Dieldrin, 76-1226
2,4,5-T, 76-1265
Thiometon, 76-1548

Hormones
see also Reproduction/growth 76-1473
In vitro
DDT isomers, 76-1195

Immunology
Animals/experimental
Beauveria bassiana, 76-0986
Carbaryl, 76-0938, 76-1042
Dioxins, 76-1236
Fenitrothion, 76-1526
Maneb, 76-1042
Methyl parathion, 76-1042
Trichlorfon, 76-1042
Zineb, 76-1042
Ziram, 76-1042
Human
Beauveria bassiana, 76-0986
In vitro
Thiabendazole, 76-0973

Integument
see Skin

Kidney
see also Excretory system
Animals/experimental
Amitrole, 76-1271
DDT, 76-0961
Diazinon, 76-1229
Dichlorvos, 76-1274
Soman, 76-1457
2,4,5-T, 76-0957, 76-1519

Laws and regulations
EEC, 76-0906
Japan, 76-1452
Organophosphates, 76-1183
United Kingdom, 76-1434
USA-EPA, 76-0915
Aldrin, 76-1426
Chlordane, 76-1184
Dieldrin, 76-1426
Heptachlor, 76-1184
USSR, 76-1094
World Health Organization
Carbamates, 76-1421
Organophosphates, 76-1421

Lipids/steroids/sterols
see also Biochemical effects
Animals/experimental
DDE, 76-0920
DDT, 76-0920, 76-1020
In vitro
Paraquat, 76-1194

Liver
see also Digestive system
Animals/experimental, 76-0919
Amitrole, 76-1271
DDE, 76-0920, 76-1536
DDT, 76-0920, 76-1038
Diazinon, 76-1229
Dichlone, 76-0921
Dichlorvos, 76-1274
Dioxins, 76-0940, 76-0959
Hexachlorobenzene, 76-1188
Lindane, 76-1492
Malathion, 76-1235
Mirex, 76-1514
Phosmet, 76-1210
Phthalide, 76-1278
2,4,5-T, 76-1238, 76-1265
Human
Bordeaux mixture, 76-1435
In vitro
DDT, 76-1493
DDT isomers, 76-1496
Diazinon, 76-1282
Dieldrin, 76-1496
Lindane, 76-1496

Lung
see also Respiratory system
Animals/experimental
Paraquat, 76-0972, 76-0976 76-1458
Human
Paraquat, 76-1163, 76-1420 76-1433

Metabolism
see also Absorption; Biotransformation; Distribution/storage; Excretion
General
Leptophos, 76-1290
Prynachlor, 76-1019
Chicken
Methoprene, 76-0963
Cow
Benomyl, 76-0992
Carbendazim, 76-0992
Dog
Benomyl, 76-0992
Carbendazim, 76-0992
Fenitrothion, 76-1538
Fish
Aldrin, 76-0964
Dieldrin, 76-0964
Fungi
2,4-DB, 76-1242
In vitro
Toxaphene, 76-1241
Insects
Carbofuran derived compound 76-1010
Mouse
Carbofuran derived compound 76-1010
Fenitrothion, 76-1538
Pig
Dichlorvos, 76-1530
Plants

Metabolism (cont'd)
Endothall, 76-0999
Ethephon, 76-0999
Lindane, 76-1016
Simazine, 76-1044
Rabbit
Fenitrothion, 76-1538
Rat
Amitrole, 76-1192
Cadmium, 76-1558
Carbofuran derived compound 76-1010
DDT, 76-0961
DDT isomers, 76-1558
Ethiophencarp, 76-1244
Fenitrothion, 76-1538
Hexachlorobenzene, 76-0930 76-0968
Polychlorinated biphenyls 76-0968
Trichloroethylene, 76-0968
Warfarin, 76-0936

Microsomes
see also Cytological effects
Animals/experimental
Amitrole, 76-1220
Dioxins, 76-0940
Piperonyl butoxide, 76-1220
In vitro
Amitrole, 76-1219
Paraoxon, 76-1483
Parathion, 76-1483
Piperonyl butoxide, 76-1219

Mitochondria
see also Cytological effects
Animals/experimental
Organochlorines, 76-1041
Organophosphates, 76-1041
In vitro
Dichloran derived compounds 76-1033
Rotenone, 76-0944

Mitosis/meiosis
see also Cytological effects
Animals/experimental
Dimethoate, 76-1213
Microorganisms
Trifluralin, 76-0935
Plants
Asulam, 76-1234
Mercurials, 76-1498

Morbidity and mortality statistics
Africa
Organochlorines, 76-1439
Columbia
Organochlorines, 76-1417
Organophosphates, 76-1417
Japan
Antibiotics, 76-1175
Carbamates, 76-1175
Mercurials, 76-1175
Organochlorines, 76-1175
Organophosphates, 76-1175 76-1179
Sweden

Morbidity and mortality statistics (cont'd)
Herbicides, 76-1185
United Kingdom
Paraquat, 76-1170, 76-1171
USA, 76-1419
Organophosphates, 76-1432

Muscle, striated
see also Musculoskeletal system
Animals/experimental, 76-1471
Fenitrothion, 76-0950
Leptophos, 76-0950
Mipafox, 76-0950

Musculoskeletal system
see also Muscle, striated
Animals/experimental
Lindane, 76-1492

Mutagenesis/teratogenesis
Animals/experimental
Captan, 76-0995
Chlormequat chloride, 76-0996
2,4-D, 76-1017
DDT, 76-1503
Ethylene thiourea, 76-1030
Fenitrothion, 76-1489
Mirex, 76-1520
Monocrotophos, 76-1499, 76-1500
Organophosphates, 76-1554
PCP, 76-0946
Piperonyl butoxide, 76-1518
Polychlorinated biphenyls 76-1017, 76-1503
Animals/non-target
Organophosphates, 76-1491
Human
Lindane, 76-1438
In vitro
Dicrotophos, 76-0924
Malathion, 76-0924
Microorganisms
Chlormequat chloride, 76-0996
Plants
Dichlorvos, 76-0988

Neonate
see also Reproduction/growth
Human
Organochlorines, 76-1437

Nervous system
see also Behavior; Brain; EEG; Parasympathetic nerves; Peripheral nerves; Spinal cord; Sympathetic nerves
Animals/experimental
DDT, 76-1462
Dimethoate, 76-1264
Endosulfan, 76-1264
Endrin, 76-1264
Leptophos, 76-0977
Lindane, 76-1462
Organochlorines, 76-1039
Organophosphates, 76-1176 76-1462
Pyrethrins, 76-1462
Rotenone, 76-1462
Animals/non-target

Nervous system (cont'd)
Leptophos, 76-1165
Human, 76-1504
Gliftor, 76-1430
Organophosphates, 76-1176
In vitro
Paraoxon, 76-1260

Nucleic acids
see also Biochemical effects
Animals/experimental
2,4,5-T, 76-1238
In vitro
Carbamates, 76-1216
Fungicides, 76-1216
Herbicides, 76-1216
Organochlorines, 76-1216

Pancreas (exocrine)
see also Digestive system
Animals/experimental
Thiram, 76-1516

Parasympathetic nerves
see also Nervous system
Animals/experimental
Chlordimeform, 76-0979

Peripheral nerves
see also Nervous system
Animals/experimental
DFP, 76-1465
Mevinphos, 76-1293
Paraoxon, 76-0980
Human
Dichlorvos, 76-1532
Organophosphates, 76-1431

Photodecomposition
Carbaryl, 76-0861
2,4-D, 76-1447
Fungicides, 76-1149
Organochlorines, 76-1114
Polychlorinated biphenyls, 76-1132

Placental transfer
see also Reproduction/growth
Animals/experimental
Carbaryl, 76-0939, 76-0960
DDT, 76-1036
Dioxins, 76-0969
Ethylene thiourea, 76-1030
Hexachlorobenzene, 76-1228
Methiocarb, 76-0939
Mexacarbate, 76-0939
PCNB, 76-1230
PCP, 76-0946
In vitro
Paraoxon, 76-1197

Plasma/serum
see also Blood/body fluids
Animals/experimental
Toxaphene, 76-1484
Warfarin, 76-1261
Human, 76-1437
In vitro
Warfarin, 76-1459

Poison control centers
USA, 76-1424

Porphyrins
see also Biochemical effects
Animals/experimental
Dichlone, 76-0921
Dioxins, 76-0978
Hexachlorobenzene, 76-0968
Polychlorinated biphenyls
76-0968, 76-0968
Trichloroethylene, 76-0968
In vitro
Paraquat, 76-1194
Plants
Norflurazon, 76-1286

Prevention
General, 76-1424
Herbicides, 76-1182
Mercurials, 76-1182
Organochlorines, 76-1182
Organophosphates, 76-0914
76-1182
Decontamination, 76-0911
Disposal, 76-0908, 76-1180, 76-1449
2,4-D, 76-1173, 76-1447
Organochlorines, 76-0910
2,4,5-T, 76-1173
Education/training, 76-0903

Reproduction/growth
see also Eggshell effects; Embryo/fetus; Fertility/sterility; Gametogen; Growth; Hormones; Neonate; Placental transfer; Reproductive organs, female; Reproductive organs, male
Animals/experimental
DDT, 76-0929, 76-1503
Dieldrin, 76-0929
Herbicides, 76-1491
Mercurials, 76-1491
Mirex, 76-1520
Organochlorines, 76-1491
Organophosphates, 76-1491
Animals/non-target
Herbicides, 76-1491
Mercurials, 76-1491
Organochlorines, 76-1491
Organophosphates, 76-1491

Reproductive organs, female
see also Reproduction/growth
Animals/experimental
Carbon tetrachloride, 76-0967
DDT isomers, 76-0967

Reproductive organs, male
see also Reproduction/growth
Animals/experimental
Diazinon, 76-1229
In vitro
DDT, 76-1497

Residue degradation
General
Juvenile hormones and analogs
76-1253
Maqbarl, 76-0851
Organochlorines, 76-1114
Animals/non-target

Residue degradation (cont'd)
Polychlorinated biphenyls
76-1132
Food and feed
BHC isomers, 76-1407
Carbaryl, 76-1399
DDT, 76-1407
Diazinon, 76-1109
Formothion, 76-1373
Methamidophos, 76-1401
Methoxychlor, 76-1407
Organochlorines, 76-0858
Phenthoate, 76-1385
Phoxim, 76-1121
Pirimiphos-ethyl, 76-1372
In vitro
Benomyl, 76-1124, 76-1125
Plants
Chloraniformethane, 76-1384
Soil, 76-0868, 76-1368, 76-1379
Azinphosmethyl, 76-1130
Benefin, 76-1147
Bensulide, 76-0899
Benthiocarb, 76-1403
Carbofuran, 76-1370
Chloraniformethane, 76-1384
Chlorfenvinphos, 76-1148
2,4-D derived compounds
76-0901
Daminozide, 76-0852
Diazinon, 76-1109
Dieldrin, 76-1370
Disulfoton, 76-0900
Herbicides, 76-1129
Mancozeb, 76-1383
Methyl parathion, 76-1122
Metobromuron, 76-1393
MSMA, 76-1157
Nitralin, 76-0899
Nitrapyrin, 76-0856
Organochlorines, 76-0858
Organophosphates, 76-0870
PCNB, 76-1144
TCA, 76-0876
Tetradifon, 76-1130
Trifluralin, 76-0897, 76-0899
Water
Organochlorines, 76-0858
76-0880
Parathion, 76-1156

Residue dynamics, 76-0869, 76-0871
76-0881
2,4-D, 76-1128
Fenitrothion, 76-0854
Lauroyl trichlorfon, 76-1380
Mercurials, 76-1115
Mirex, 76-0863
Organochlorines, 76-0894, 76-1115
Phosphine, 76-1381
Polychlorinated biphenyls, 76-0894
76-1115
Trichlorfon, 76-1380

Residue removal
Food and feed
DDT, 76-0902
Malathion, 76-1398

Residue removal (cont'd)
Soil
DDT, 76-1366
Water
DDT, 76-1118
Dimethoate, 76-1118
Diuron, 76-1118
Endosulfan, 76-1118
Herbicides, 76-0890
Lindane, 76-1150
Malathion, 76-1118
Paraquat, 76-1118
Parathion, 76-1118

Residues/air
Residential
Propoxur, 76-1113
Rural
DDT isomers, 76-1375
Methyl parathion, 76-1375
Toxaphene, 76-1375
Vehicle
DEF, 76-0857
Dimethoate, 76-0857
Methyl demeton, 76-0857

Residues/food and feed
General, 76-0896, 76-1139
BHC, 76-1416
BHC isomers, 76-0873
Chlordane, 76-1416
DDT, 76-0873
Heptachlor, 76-1416
Heptachlor epoxide, 76-1416
Hexachlorobenzene, 76-1415
Lindane, 76-0873, 76-1416
Organochlorines, 76-1413
Polychlorinated biphenyls 76-1413
Total diet
Organochlorines, 76-0850
Animal feed
BHC isomers, 76-1374
Dieldrin, 76-1374
Heptachlor epoxide, 76-1374
Cereals
Arsenicals, 76-1119
Carbamates, 76-1119
Diazinon, 76-1119
Dicofol, 76-1119
Ethylene dibromide, 76-1145
Fungicides, 76-1119
Hydrogen cyanide, 76-1389
Malathion, 76-1119
Methyl bromide, 76-1389
Parathion, 76-1119
Phenthoate, 76-1385
Phosphine, 76-1381, 76-1389 76-1390
Dairy products
BHC isomers, 76-1374
Chlorpyrifos, 76-1120
Dieldrin, 76-1374
Heptachlor epoxide, 76-1374
Organochlorines, 76-1358 76-1361, 76-1367, 76-1395 76-1414
Fish, 76-1386

Residues/food and feed (cont'd)
Fruits
Aldrin, 76-1412
Arsenicals, 76-1119
Benomyl, 76-1151
BHC, 76-1412
Captan, 76-1151
Carbamates, 76-1119
Carbaryl, 76-1399
Carbendazim, 76-1400
DAEP, 76-1137
DDT, 76-1412
Diazinon, 76-1119
Dichlofluanid, 76-1151
Dicofol, 76-1119
Dieldrin, 76-1412
Disulfoton, 76-1138
Endrin, 76-1412
Folpet, 76-1151
Fungicides, 76-1119
Malathion, 76-1119
Mancozeb, 76-1151
Organochlorines, 76-1394
Organophosphates, 76-1394
Parathion, 76-1119
Phenamiphos, 76-1289
Quinalphos, 76-1142
Simazine, 76-1391
Streptomycin, 76-1140
2,4,5-T, 76-1135
Meat, 76-1386
BHC, 76-1411
DDT, 76-0902, 76-1411
Organochlorines, 76-1360
Poultry, 76-1386
Vegetables, 76-1581, 76-1581 76-1581
Aldrin, 76-1412
Atrazine, 76-1158
Benefin, 76-1147
Benomyl, 76-1127
BHC, 76-1412
Carbaryl, 76-1396, 76-1397
2,4-D, 76-1135
DAEP, 76-1137
DDT, 76-1397, 76-1412
Dieldrin, 76-1412
Diphenamid, 76-1392
Endosulfan, 76-1397
Endrin, 76-1412, 76-1581
Fensulfothion, 76-1409
Malathion, 76-1398, 76-1581
Methomyl, 76-1141
Methyl parathion, 76-1581
Phorate, 76-1387
Prometryne, 76-1158
Quinalphos, 76-1142
Thonazin, 76-1387

Residues/humans
General
BHC, 76-1143
BHC isomers, 76-0873
DDE, 76-1404
DDT, 76-0873, 76-1143, 76-1362
Dieldrin, 76-1362
Lead, 76-1404
Lindane, 76-0873

Residues/humans (cont'd)
Polychlorinated biphenyls 76-1362, 76-1404
Adipose
Organochlorines, 76-0875
Polychlorinated biphenyls 76-0875
Blood, 76-1376
BHC, 76-1388
BHC isomers, 76-1369
DDE, 76-1369
DDT, 76-1369, 76-1388
DDT isomers, 76-1376
Dieldrin, 76-1376
Polychlorinated biphenyls 76-1388
Milk
BHC, 76-1411
DDT, 76-1411
Organochlorines, 76-1358 76-1363, 76-1406, 76-1414

Residues/non-target organisms
General, 76-1139
Herbicides, 76-0932
Hexachlorobenzene, 76-1377
Maqbarl, 76-0851
Toxaphene, 76-0892
Bat
DDE, 76-1110
Organochlorines, 76-1134
Polychlorinated biphenyls 76-1110, 76-1134
Birds, 76-0884
DDT, 76-0872
Mercurials, 76-0872
Mirex, 76-0863
Organochlorines, 76-0875
Polychlorinated biphenyls 76-0872, 76-0875
Crustacea
Organochlorines, 76-0898
Toxaphene, 76-0893
Duck
DDT, 76-1378
Mercurials, 76-1378
Polychlorinated biphenyls 76-1378
Eagle
DDT, 76-1378
Mercurials, 76-1378
Polychlorinated biphenyls 76-1378
Fish, 76-0884
Cadmium, 76-1153
Copper, 76-1153
DDE, 76-1112
DDT, 76-0872, 76-1112, 76-1153
Mercurials, 76-0872, 76-1153 76-1371
Mirex, 76-0863
Organochlorines, 76-1108 76-1371
Polychlorinated biphenyls 76-0872, 76-1112, 76-1153
TDE, 76-1112
Toxaphene, 76-0893
Goose

Residues/non-target organisms (cont'd)
DDT, 76-1378
Mercurials, 76-1378
Polychlorinated biphenyls 76-1378
Molluscs
DDE, 76-1112
DDT, 76-1112
Organochlorines, 76-0898
Polychlorinated biphenyls 76-1112
TDE, 76-1112
Toxaphene, 76-0893
Plankton/algae
Organochlorines, 76-0898
Plants
Lauroyl trichlorfon, 76-1380
Trichlorfon, 76-1380
Rabbit
Organochlorines, 76-1408
Seal
Organochlorines, 76-0875
Polychlorinated biphenyls 76-0875
Sheep
Organochlorines, 76-0875 76-0875

Residues/plants
Cotton
Benomyl, 76-1405
Carbendazim, 76-1405
DDT, 76-1146
Methyl parathion, 76-1146
Forest, 76-0887
Medicinals and condiments
Organochlorines, 76-0864 76-0867
Tobacco
DDT, 76-0853, 76-1152
Dieldrin, 76-1152
Endosulfan, 76-0853, 76-1152
Endrin, 76-0853, 76-1152
Fenthion, 76-0909
TDE, 76-0853, 76-1152
Toxaphene, 76-0853
Zineb, 76-1341

Residues/soil
General, 76-0884
Carbofuran, 76-1370
Dieldrin, 76-1370
Fumigants, 76-0941
Herbicides, 76-1131
Organochlorines, 76-0883
Adsorption, 76-1368
Atrazine, 76-1133, 76-1159 76-1382
Chloramben, 76-1162
1,2-Dibromo-3-chloropropane 76-1123
Fluometuron, 76-0866
GS-14254, 76-1159
PCP, 76-0878
Terbutryne, 76-1159
Movement
Atrazine, 76-1158
Azinphosmethyl, 76-1130

Residues/soil (cont'd)
Diuron, 76-0862
Fluometuron, 76-0862, 76-0866
Organophosphates, 76-0870
Prometryne, 76-0877, 76-1158
Tetradifon, 76-1130
Volatilization, 76-0868
Butralin, 76-1126
2,4-D, 76-1160
Nitrapyrin, 76-0856
Trifluralin, 76-1126

Residues/water
General, 76-0884
BHC isomers, 76-0873
DDT, 76-0873
DDT isomers, 76-1359
Lindane, 76-0873
Organochlorines, 76-0883
Polychlorinated biphenyls 76-1359
Estuaries/marshes
DDE, 76-0888
DDT, 76-0888
Organochlorines, 76-0898
TDE, 76-0888
Toxaphene, 76-0892, 76-0893
Groundwater/rain, 76-1116
Aldrin, 76-0895
Atrazine, 76-0895
Dicamba, 76-0895
Glyphosate, 76-1161
Heptachlor, 76-0895
Herbicides, 76-0885
Organochlorines, 76-0855 76-0886, 76-0889
Lakes/ponds
Herbicides, 76-0932
Molinate, 76-0859
Organochlorines, 76-0879
Oceans/seas
DDT isomers, 76-1365
Organochlorines, 76-1117
Rivers/streams
Fenitrothion, 76-0854
Herbicides, 76-0932
Organochlorines, 76-0865 76-0886, 76-1111
PCP, 76-1155
Polychlorinated biphenyls 76-0865
Wastewater, 76-1410
Fungicides, 76-0882
Herbicides, 76-0882
Organophosphates, 76-0882
Toxaphene, 76-0893

Respiration, cellular
see also Biochemical effects
Animals/experimental, 76-1196
Amitrole, 76-1220
Cyanide, 76-0975
Organochlorines, 76-1041
Organophosphates, 76-1041
Piperonyl butoxide, 76-1220
Plictran, 76-1211
Synergists, 76-1221
TDE, 76-1022

Respiration, cellular (cont'd)
In vitro
Amitrole, 76-1219
Phosphine, 76-1015
Piperonyl butoxide, 76-1219
Microorganisms
2,4-D, 76-1256
Dinoseb acetate, 76-1288
Fungicides, 76-1255
Herbicides, 76-1255
Lindane, 76-1309, 76-1528
Phorate, 76-1528
Plants
DDT, 76-1013

Respiratory system
see also Lung; Upper respiratory tract
Animals/experimental
Dichlorvos, 76-1210
Fenitrothion, 76-1210
Hempa, 76-1187
Phosmet, 76-1210
Soman, 76-0948
Human
Gliftor, 76-1430
Paraquat, 76-1427

Reviews
Analysis, 76-1058, 76-1059, 76-1070 76-1078, 76-1592
Organophosphates, 76-1570
Trichlorfon, 76-1570
Epidemiology, prevention, and treatment, 76-0845
Monitoring and residues, 76-0845
Organochlorines, 76-0864
Toxicology and pharmacology 76-1295, 76-1344, 76-1527
DDT, 76-1462
Lindane, 76-1462
Organophosphates, 76-1462
Pyrethrins, 76-1462
Rotenone, 76-1462

Safety standards
General, 76-1452
Microbial insecticides, 76-1169
TLV/MAC
BHC, 76-1436
Carbaryl, 76-1436
DDT, 76-1436
Lindane, 76-1436
Mercurials, 76-1454
Polychloropinene, 76-1436
Toxaphene, 76-1436

Sensory system
see Balance; Hearing; Vision

Skin
see also Integument
Animals/experimental
Coumaphos, 76-1250
Crufomate, 76-1023

Skin (cont'd)
Deet, 76-1563
Human, 76-0954
Dalapon, 76-1450

Spectrometry
see also Analysis
Atomic absorption/emission
DDT, 76-1312
Synergists, 76-1053
Colorimetry, 76-1336, 76-1337
Carbamates, 76-1572
Hexachlorobutadiene, 76-1587
Maleic hydrazide, 76-1571
Organophosphates, 76-1578
Trifenmorph, 76-1338
Fluorometry, 76-1081, 76-1324
Coumaphos, 76-1313
Oxythioquinox, 76-1063
Infrared
Amitrole, 76-1577
Methiocarb, 76-1321
Metribuzin, 76-1585
Mass spectrometry, 76-1591
2,4-D, 76-1048
2,4-D derived compounds 76-1048
DDE, 76-1334
DDT, 76-1334, 76-1567
Dieldrin, 76-1334
Diuron, 76-1072
Fungicides, 76-1046
Herbicides, 76-1077
Linuron, 76-1072
Methiocarb, 76-1321
Metoxuron, 76-1072
Organochlorines, 76-1077
Organophosphates, 76-1077
TDE, 76-1334
Triazines, 76-1047
NMR
Amitrole, 76-1577
Methiocarb, 76-1321
Tetranactin, 76-1323
Raman, 76-1066
DDT, 76-1066
DDT derived compounds 76-1066
Dieldrin, 76-1066
Endosulfan, 76-1066
Endrin, 76-1066
Heptachlor, 76-1066
UV
Hexachlorobutadiene, 76-1587
Thiophanate-methyl, 76-1579

Spinal cord
see also Nervous system
Animals/experimental
Aldrin, 76-0949
Carbamates, 76-1267
Dieldrin, 76-0949
Organophosphates, 76-1267

Sympathetic nerves
see also Nervous system
Animals/experimental
Chlordimeform, 76-0979
In vitro

Sympathetic nerves (cont'd)
Organophosphates, 76-0971

Therapeutic use
General
TDE, 76-0991
Cancer
TDE, 76-1262, 76-1517
Helminthiasis
Coumaphos, 76-1028

Thermal decomposition
Organochlorines, 76-1114

Thymus
see also Endocrine system
Animals/experimental
2,4,5-T, 76-1265

Titration
see also Analysis
Carbamates, 76-1332
2,4-D, 76-1340
Methabenzthiazuron, 76-1340
Picloram, 76-1340

Toxicity/experimental animals
General, 76-1021
Acephate, 76-1551
Arsenicals, 76-1511
Chlormephos, 76-1508
Cypendazole, 76-1547
Deet, 76-1563
Dimethatryne - piperophos 76-1560, 76-1560
Dimethirimol, 76-1547
Fenitrothion, 76-0974
Methamidophos, 76-1551
Methyl parathion, 76-0974
Napropamide, 76-1560, 76-1560
Prothiophos, 76-1547
Annelids, 76-1504
Bee
Carbaryl, 76-1043
Juvenile hormones and analogs 76-0922
Parathion, 76-1043
Birds
Thallium sulfate, 76-1208
Cat
Organophosphates, 76-1198
Cow
Crufomate, 76-1023
Organochlorines, 76-1252
Organophosphates, 76-1252
Crustacea
Aldrin, 76-0994
Chlordane, 76-1266
DDE, 76-0994
Dieldrin, 76-0994
Difluron, 76-1291
Polychlorinated biphenyls 76-0994
Toxaphene, 76-1001
Dog
Amitrole, 76-1271
Bifenox, 76-1018
Bromacil, 76-1031
Earthworm
Benomyl, 76-1281

Toxicity/experimental animals (cont'd)
Fish
Azinphosmethyl, 76-1258
Bromacil, 76-1031
Chlordane, 76-1266
Dimethoate, 76-1264
Endosulfan, 76-1264
Endrin, 76-1264
Fungicides, 76-1546
Heptachlor, 76-1300
Heptachlor epoxide, 76-1300
Herbicides, 76-1546
Malathion, 76-1264
Organophosphates, 76-1302
PCP, 76-1258, 76-1259
Pyrethrins, 76-1476
Resmethrin, 76-1292
Sodium chloride, 76-1258 76-1259
Toxaphene, 76-1001
Frog
Methabenzthiazuron, 76-1468
Metoxuron, 76-1468
Pyrazon, 76-1468
Fungi
Benomyl, 76-1006
Goat
Diazinon, 76-1193
Dichlorvos, 76-1193
Dicrotophos, 76-1193
Malathion, 76-1193
Phosphamidon, 76-1193
Guinea pig
Fenuron, 76-0984
Human, 76-1504
Insects
Carbaryl, 76-1227
Difluron, 76-1291
Landrin, 76-1227
Methomyl, 76-1227
Organochlorines, 76-1305 76-1305
Parathion, 76-1222
Propoxur, 76-1227
Tetrachlorvinphos, 76-1227
Microorganisms
Benomyl, 76-1006
Captan, 76-1007
Chlorpropham, 76-1225
2,4-D, 76-1463
Dichlobenil, 76-1004
Dichloran, 76-1007
Dinoseb acetate, 76-1288
Diquat, 76-1004
Disulfoton, 76-1224
Diuron, 76-1004
Drazoxolon, 76-1007
Fenaminosulf, 76-0989
Fungicides, 76-1255
Herbicides, 76-1255
Lindane, 76-1495
Malathion, 76-1306
Simazine, 76-1463
2,4,5-T, 76-1217
Triarimol, 76-1007
Trifluralin, 76-1303
Molluscs

Toxicity/experimental animals (cont'd)
Chlordane, 76-1266
2,4-D, 76-1040
Heptachlor, 76-1300
Heptachlor epoxide, 76-1300
Toxaphene, 76-1040
Mouse
Chlorfenvinphos, 76-1461
Dichlorvos, 76-0928
Fospirate, 76-0928
GC-6506, 76-0928
Hexachlorobutadiene, 76-1531
MCPCA, 76-1552
Naled, 76-0928
Organophosphates, 76-1198
Oryzemate, 76-1451
Oxinothiophos, 76-1461
2,4,5-T, 76-1265
Toxaphene, 76-1461
Trichlorfon, 76-0928
Pheasant
Bifenox, 76-1018
Plankton/algae
2,4-D, 76-1215, 76-1256
DDE, 76-0997
DDT, 76-0997, 76-1215
Dieldrin, 76-0997
Dieldrin derived compounds 76-0997
Endrin, 76-0997
Malathion, 76-1215
Mexacarbate, 76-0997
Rotenone, 76-1215
2,4,5-T, 76-0997, 76-1215
TDE, 76-0997
Plants
Carbaryl, 76-1227
Landrin, 76-1227
Methomyl, 76-1227
Propoxur, 76-1227
Tetrachlorvinphos, 76-1227
Quail
Fenitrothion, 76-1201
Rabbit
Bifenox, 76-1018
Bromacil, 76-1031
Rat
Bifenox, 76-1018
Fenitrothion, 76-1200
Fenitrothion derived compounds 76-1200
Fenuron, 76-0984
Hexachlorobutadiene, 76-1531
Malathion, 76-1543
MCPCA, 76-1552
Oryzemate, 76-1451
Phoxim, 76-1543
Resmethrin, 76-0998
Thio-tepa, 76-1515
Reindeer
Famphur, 76-1307

Toxicity/humans
General, 76-1294, 76-1443
Organochlorines, 76-1417 76-1428
Organophosphates, 76-0914 76-1417, 76-1425, 76-1428

Toxicity/humans (cont'd)
Paraquat, 76-1427, 76-1428 76-1433
Accidental
2,4-D, 76-1002
Dicamba, 76-1002
Endosulfan, 76-1167
Fosfotex, 76-1298
Gliftor, 76-1430
Malathion, 76-1298
Methyl bromide, 76-1440
Phorate, 76-0905
Picloram, 76-1002
Trichlorfon, 76-1298
Experimental
Dichlorvos, 76-1532
Intentional
DDT, 76-1020
Diazinon, 76-1168
Dieldrin, 76-1020
Endosulfan, 76-1167
Fenthion, 76-1177
Lindane, 76-1020
Methidathion, 76-1423
Paraquat, 76-0904, 76-1420
Occupational, 76-1376, 76-1441 76-1456, 76-1504
Arsenicals, 76-1453
Beauveria bassiana, 76-0986
Bordeaux mixture, 76-1435
Carbamates, 76-1421
Copper sulfate, 76-1178
Dalapon, 76-1450
DDT, 76-0947
DDT isomers, 76-1376
Dieldrin, 76-1174, 76-1376
Fenthion, 76-0909
Herbicides, 76-0907, 76-1185 76-1442
Lindane, 76-0947
Malathion, 76-0947
Organochlorines, 76-0907 76-1276, 76-1442, 76-1445
Organophosphates, 76-0907 76-1178, 76-1179, 76-1276 76-1421, 76-1422, 76-1431 76-1445
PCP, 76-0947
Pyrethrum, 76-0947
Sarin, 76-1166

Toxicity/non-target organisms
General, 76-0908, 76-0916, 76-1443
2,4-D, 76-0913, 76-1002
Dicamba, 76-1002
Herbicides, 76-1182
Mercurials, 76-1182
Organochlorines, 76-1182
Organophosphates, 76-1182
Picloram, 76-1002
Bee, 76-0903
Birds
DDE, 76-0917
Dieldrin, 76-0917
Polychlorinated biphenyls 76-0917
Cow
Phorate, 76-0905

Toxicity/non-target organisms (cont'd)
Crustacea
DDT, 76-1418
Eggs
DDE, 76-0917
Dieldrin, 76-0917
Polychlorinated biphenyls 76-0917
Microorganisms, 76-1172
Organochlorines, 76-1448
Molluscs
Herbicides, 76-0912
Plankton/algae
Herbicides, 76-0912
Plants
2,4-D, 76-1455
2,4,5-T, 76-1455

Treatment of poisoning, 76-0993
General, 76-1424
Herbicides, 76-1182
Mercurials, 76-1182
Organochlorines, 76-1182 76-1439
Organophosphates, 76-1181 76-1182
Paraquat, 76-1163, 76-1164
Atropine
Chlormephos, 76-1508
Fenthion, 76-1177
Methidathion, 76-1423
Parathion, 76-1233
Phorate, 76-0905
Phosphamidon, 76-1550
Sarin, 76-0918
Dialysis, 76-1444
Mercurials, 76-1136
Paraquat, 76-0904
Diazepam
Soman, 76-0948
Diet
Dieldrin, 76-1174
Oximes
Parathion, 76-1233
Phosphamidon, 76-1550
Oxygen
Methyl bromide, 76-1440
Paraquat, 76-1420
Pralidoxime
Chlormephos, 76-1508
Fenthion, 76-1177
Sarin, 76-0918
Toxogonin
Methidathion, 76-1423
Transfusion, 76-1444
Vitamins
Organochlorines, 76-1445
Organophosphates, 76-1445

Upper respiratory tract
see also Respiratory system
Human, 76-1441

Vision
see also Sensory system
Animals/experimental
Dichlorvos, 76-1274, 76-1277
Disulfoton, 76-1522
Fenitrothion, 76-1273, 76-1486

Vision (cont'd)
Fenthion, 76-1486
Thiometon derived compound 76-1273
Human, 76-1456
Organophosphates, 76-1179

Vitamins/coenzymes
see also Biochemical effects
Animals/experimental
Carbamates, 76-1482
Organochlorines, 76-1445
Organophosphates, 76-1445 76-1482
Warfarin, 76-1261

Vitamins/coenzymes (cont'd)
Human
Organochlorines, 76-1445
Organophosphates, 76-1445
In vitro
Leptophos, 76-1203
Rotenone, 76-0944

Acephate
see also Organophosphates
Toxicity/experimental animals
General, 76-1551

Aldrin
see also Organochlorines
Biotransformation
Monkey, 76-0945
Rat, 76-0945
Chromatography
Gas-liquid, 76-1073, 76-1325
Laws and regulations
USA-EPA, 76-1426
Metabolism
Fish, 76-0964
Residues/food and feed
Fruits, 76-1412
Vegetables, 76-1412
Residues/water
Groundwater/rain, 76-0895
Spinal cord
Animals/experimental, 76-0949
Toxicity/experimental animals
Crustacea, 76-0994

Alvit-55
see Dieldrin

3-Amino-1,2,4-triazole
see Amitrole

Amiphos
see DAEP

Amitrole
see also Herbicides
Amino acids/peptides/proteins
Animals/experimental, 76-1249
Endocrine system
Animals/experimental, 76-1271
Enzyme activity
General, 76-1249
Factors influencing metabolism/toxicity
Adaptation, 76-1220
Interactions, 76-1249
Growth
Animals/experimental, 76-1249
Kidney
Animals/experimental, 76-1271
Liver
Animals/experimental, 76-1271
Metabolism
Rat, 76-1192
Microsomes
Animals/experimental, 76-1220
In vitro, 76-1219
Respiration, cellular
Animals/experimental, 76-1220
In vitro, 76-1219
Spectrometry
Infrared, 76-1577
NMR, 76-1577
Toxicity/experimental animals
Dog, 76-1271

Antibiotics
see also Polyoxin A; Polyoxin B; Streptomycin; Tetranactin
Morbidity and mortality statistics
Japan, 76-1175

Aretit
see Dinoseb acetate

Armine
see also Organophosphates
Behavior
Animals/experimental, 76-1506
Enzyme activity
Cholinesterase, 76-1202

Arsenicals
Factors influencing metabolism/toxicity
Formulation, 76-1511
Residues/food and feed
Cereals, 76-1119
Fruits, 76-1119
Toxicity/experimental animals
General, 76-1511
Toxicity/humans
Occupational, 76-1453

Asulam
see also Herbicides
Mitosis/meiosis
Plants, 76-1234

Atrazine
see also Herbicides
Bioassay, 76-1087
Biotransformation
Microorganisms, 76-1133
Residues/food and feed
Vegetables, 76-1158
Residues/soil
Adsorption, 76-1133, 76-1159 76-1382
Movement, 76-1158
Residues/water
Groundwater/rain, 76-0895

Atropine
Factors influencing metabolism/toxicity
Interactions, 76-0931

Avadex
see Di-allate

Avicides
see 3-Chloro- p-toluidine

Azinphosmethyl
see also Organophosphates
Chromosomes/genes
In vitro, 76-1501
Residue degradation
Soil, 76-1130
Residues/soil
Movement, 76-1130

Azinphosmethyl (cont'd)
Toxicity/experimental animals
Fish, 76-1258

Azodrin
see Monocrotophos

Bacdip
see Oxinothiophos

BAS 290-H
see Prynachlor

Baygon
see Propoxur

Baythion
see Phoxim

Beauveria bassiana
see also Microbials
Immunology
Animals/experimental, 76-0986
Human, 76-0986
Toxicity/humans
Occupational, 76-0986

Benefin
see also Herbicides
Residue degradation
Soil, 76-1147
Residues/food and feed
Vegetables, 76-1147

Benomyl
see also Fungicides
Chromatography
Thin-layer, 76-1405
Growth
Animals/experimental, 76-1281
Metabolism
Cow, 76-0992
Dog, 76-0992
Residue degradation
In vitro, 76-1124, 76-1125
Residues/food and feed
Fruits, 76-1151
Vegetables, 76-1127
Residues/plants
Cotton, 76-1405
Toxicity/experimental animals
Earthworm, 76-1281
Fungi, 76-1006
Microorganisms, 76-1006

Bensulide
see also Herbicides
Residue degradation
Soil, 76-0899

Benthiocarb
see also Carbamates; Herbicides
Chromatography
Gas-liquid, 76-1336
Residue degradation
Soil, 76-1403

Benzomate
Chromatography
Gel permeation, 76-1593
BHC
see also Organochlorines
Chromatography
Gas-liquid, 76-1325
Distribution/storage
Human, 76-1143
Heart
Animals/experimental, 76-1226
Residues/food and feed
General, 76-1416
Fruits, 76-1412
Meat, 76-1411
Vegetables, 76-1412
Residues/humans
General, 76-1143
Blood, 76-1388
Milk, 76-1411
Safety standards
TLV/MAC, 76-1436
γ-BHC
see Lindane
BHC isomers
Chromatography
Thin-layer, 76-1342
Excretion
Mouse, 76-1025
Residue degradation
Food and feed, 76-1407
Residues/food and feed
General, 76-0873
Animal feed, 76-1374
Dairy products, 76-1374
Residues/humans
General, 76-0873
Blood, 76-1369
Residues/water
General, 76-0873
Bidrin
see Dicrotophos
Bifenox
see also Herbicides
Toxicity/experimental animals
Dog, 76-1018
Pheasant, 76-1018
Rabbit, 76-1018
Rat, 76-1018
Biphenyl
see also Fungicides
Biotransformation
In vitro, 76-0934
Bordeaux mixture
see also Fungicides
Carcinogenesis
Human, 76-1435
Liver
Human, 76-1435
Toxicity/humans
Occupational, 76-1435
Bromacil
see also Herbicides
Toxicity/experimental animals
Bromacil (cont'd)
Dog, 76-1031
Fish, 76-1031
Rabbit, 76-1031
Bromoxynil
see also Herbicides
Biotransformation
Microorganisms, 76-1218
Butacarb
see also Carbamates
Enzyme activity
Esterases, 76-1481
Butralin
see also Herbicides
Residues/soil
Volatilization, 76-1126
Butylate
see also Herbicides
Chromatography
Gas-liquid, 76-1067
Cadmium
see also Heavy metals
Factors influencing metabolism/toxicity
Interactions, 76-1558
Metabolism
Rat, 76-1558
Residues/non-target organisms
Fish, 76-1153
Captan
see also Fungicides
Chromatography
Gas-liquid, 76-1336
Growth
Microorganisms, 76-1007
Mutagenesis/teratogenesis
Animals/experimental, 76-0995
Residues/food and feed
Fruits, 76-1151
Toxicity/experimental animals
Microorganisms, 76-1007
Carbamates
see also Benthiocarb; Butacarb; Carbaryl; Carbendazim; Carbofuran; Cartap; Chlorpropham; Di-allate; EPTC; Ethiophencarp; Landrin; Mancozeb; Maneb; Maqbarl; Methiocarb; Methomyl; Mexacarbate; 1-Naphthol; Propoxur; Zineb; Ziram
Chromatography
General, 76-1056
Column, 76-1586
Gas-liquid, 76-1065, 76-1084 76-1085, 76-1086, 76-1339
Chromosomes/genes
In vitro, 76-1216
Electrometry
Conductometry, 76-1318
Embryo/fetus
Animals/experimental, 76-1482
Enzyme assay
Cholinesterase, 76-1586
Carbamates (cont'd)
Experimental design
Toxicology and pharmacology 76-1216
Laws and regulations
World Health Organization 76-1421
Morbidity and mortality statistics
Japan, 76-1175
Nucleic acids
In vitro, 76-1216
Residues/food and feed
Cereals, 76-1119
Fruits, 76-1119
Spectrometry
Colorimetry, 76-1572
Spinal cord
Animals/experimental, 76-1267
Titration, 76-1332
Toxicity/humans
Occupational, 76-1421
Vitamins/coenzymes
Animals/experimental, 76-1482
Carbaryl
see also Carbamates
Behavior
Animals/experimental, 76-1270
Bioassay, 76-1581
Biotransformation
In vitro, 76-1478
Insects, 76-1209
Microorganisms, 76-0943
Chromatography
Permethrin, 76-1582
Distribution/storage
Rat, 76-0939, 76-0960
Embryo/fetus
Animals/experimental, 76-0960
Excretion
Rat, 76-0960
Factors influencing metabolism/toxicity
Interactions, 76-0938, 76-1043
Pregnancy, 76-0939, 76-0960
Growth
Animals/experimental, 76-1269
Microorganisms, 76-1464
Immunology
Animals/experimental, 76-0938 76-1042
Photodecomposition, 76-0861
Placental transfer
Animals/experimental, 76-0939 76-0960
Residue degradation
Food and feed, 76-1399
Residues/food and feed
Fruits, 76-1399
Vegetables, 76-1396, 76-1397
Safety standards
TLV/MAC, 76-1436
Toxicity/experimental animals
Bee, 76-1043
Insects, 76-1227
Carbendazim
see also Carbamates; Fungicides
Chromatography
Thin-layer, 76-1405

Carbendazim (cont'd)
Metabolism
Cow, 76-0992
Dog, 76-0992
Residues/food and feed
Fruits, 76-1400
Residues/plants
Cotton, 76-1405

Carbofuran
see also Carbamates
Biotransformation
Microorganisms, 76-1490
Factors influencing metabolism/toxicity
Interactions, 76-1190
Residue degradation
Soil, 76-1370
Residues/soil
General, 76-1370

Carbofuran derived compound
Factors influencing metabolism/toxicity
Taxon, 76-1010
Metabolism
Insects, 76-1010
Mouse, 76-1010
Rat, 76-1010

Carbon tetrachloride
see also Fumigants
Enzyme activity
Ornithine decarboxylase, 76-0967
Factors influencing metabolism/toxicity
Interactions, 76-0967
Reproductive organs, female
Animals/experimental, 76-0967

Carboxin
see also Fungicides
Cytological effects
Plants, 76-1212

Cartap
see also Carbamates
Distribution/storage
Mouse, 76-1446

Chemosterilants
see Hempa; Thio-tepa

Chloramben
see also Herbicides
Residues/soil
Adsorption, 76-1162

Chloraniformethane
see also Fungicides
Residue degradation
Plants, 76-1384
Soil, 76-1384

Chlordane
see also Organochlorines
Growth
Microorganisms, 76-1257
Laws and regulations
USA-EPA, 76-1184
Residues/food and feed
General, 76-1416
Toxicity/experimental animals
Crustacea, 76-1266
Fish, 76-1266
Molluscs, 76-1266

Chlordecone
Environmental pollution, 76-1093

Chlordimeform
Biotransformation
Insects, 76-1248
Distribution/storage
Insects, 76-1248
Factors influencing metabolism/toxicity
Interactions, 76-1248
Parasympathetic nerves
Animals/experimental, 76-0979
Sympathetic nerves
Animals/experimental, 76-0979

Chlorfenvinphos
see also Organophosphates
Factors influencing metabolism/toxicity
Humidity, 76-1461
Interactions, 76-1190
Residue degradation
Soil, 76-1148
Toxicity/experimental animals
Mouse, 76-1461

Chlormephos
see also Organophosphates
Toxicity/experimental animals
General, 76-1508
Treatment of poisoning
Atropine, 76-1508
Pralidoxime, 76-1508

Chlormequat chloride
see also Herbicides
Mutagenesis/teratogenesis
Animals/experimental, 76-0996
Microorganisms, 76-0996

4-Chloro-3-*N*-prophylsulfinylphenyl 4-nitrophenyl ether
see Phenproxide

3-Chloro-*p*-toluidine
see also Avicides
Biotransformation
Birds, 76-0962
Distribution/storage
Birds, 76-0962
Factors influencing metabolism/toxicity
Interactions, 76-0962

Chloroneb
see also Fungicides
Biotransformation
Plants, 76-1284

Chlorpropham
see also Carbamates; Herbicides
Growth
Microorganisms, 76-1225
Toxicity/experimental animals
Microorganisms, 76-1225

Chlorpyrifos
see also Organophosphates
Residues/food and feed
Dairy products, 76-1120

Cidial
see Phenthoate

CIPC
see Chlorpropham

Cisanilide
see also Herbicides
Biotransformation
In vitro, 76-1014
Enzyme activity
Mixed function oxidases, 76-1014

Coopertox
see Toxaphene

Copper
see also Fungicides; Heavy metals
Residues/non-target organisms
Fish, 76-1153

Copper sulfate
see also Fungicides
Enzyme activity
General, 76-1178
Toxicity/humans
Occupational, 76-1178

Coumaphos
see also Organophosphates
Skin
Animals/experimental, 76-1250
Spectrometry
Fluorometry, 76-1313
Therapeutic use
Helminthiasis, 76-1028

Croneton
see Ethiophencarp

Crufomate
see also Organophosphates
Enzyme activity
Cholinesterase, 76-1023
Skin
Animals/experimental, 76-1023
Toxicity/experimental animals
Cow, 76-1023

Cyanide
Respiration, cellular
Animals/experimental, 76-0975

Cypendazole
see also Fungicides
Toxicity/experimental animals
General, 76-1547

Cythion
see Malathion

2,4-D
see also Herbicides
Biotransformation
Microorganisms, 76-1189
Plants, 76-1283, 76-1509
Sheep, 76-1189
Carbohydrates
Plants, 76-1285
Chromatography

2,4-D (cont'd)
Gas-liquid, 76-1048
Embryo/fetus
Animals/experimental, 76-1017
Enzyme activity
ATPase, 76-0953
Transketolase, 76-0953
Factors influencing metabolism/toxicity
Nutritional state, 76-1509
Growth
Microorganisms, 76-1215
Mutagenesis/teratogenesis
Animals/experimental, 76-1017
Photodecomposition, 76-1447
Prevention
Disposal, 76-1173, 76-1447
Residue dynamics, 76-1128
Residues/food and feed
Vegetables, 76-1135
Residues/soil
Volatilization, 76-1160
Respiration, cellular
Microorganisms, 76-1256
Spectrometry
Mass spectrometry, 76-1048
Titration, 76-1340
Toxicity/experimental animals
Microorganisms, 76-1463
Molluscs, 76-1040
Plankton/algae, 76-1215, 76-1256
Toxicity/humans
Accidental, 76-1002
Toxicity/non-target organisms
General, 76-0913, 76-1002
Plants, 76-1455

2,4-D derived compounds
Chromatography
Gas-liquid, 76-1048
Residue degradation
Soil, 76-0901
Spectrometry
Mass spectrometry, 76-1048

DAEP
see also Organophosphates
Chromatography
Thin-layer, 76-1343
Residues/food and feed
Fruits, 76-1137
Vegetables, 76-1137

Dalapon
see also Herbicides
Skin
Human, 76-1450
Toxicity/humans
Occupational, 76-1450

Daminozide
see also Herbicides
Residue degradation
Soil, 76-0852

2,4-DB
see also Herbicides
Metabolism
Fungi, 76-1242

DCNA
see Dichloran

DDD
see TDE

DDE
see also Organochlorines
Analysis
Sample preparation, 76-1069
Behavior
Animals/experimental, 76-1545
Biotransformation
Rat, 76-0920
Chromatography
Gas-liquid, 76-1062, 76-1325 76-1334
Distribution/storage
Cow, 76-1246, 76-1251
Fish, 76-0942
Rat, 76-1536
Eggshell effects
Animals/experimental, 76-1247 76-1272, 76-1544
Animals/non-target, 76-0917
Electrolytes
Animals/experimental, 76-1272
Enzyme activity
ATPase, 76-1272
Mixed function oxidases, 76-1472
Excretion
Cow, 76-1251
Factors influencing metabolism/toxicity
Nutritional state, 76-1536
Lipids/steroids/sterols
Animals/experimental, 76-0920
Liver
Animals/experimental, 76-0920 76-1536
Lysosomes
In vitro, 76-1297
Residues/humans
General, 76-1404
Blood, 76-1369
Residues/non-target organisms
Bat, 76-1110
Fish, 76-1112
Molluscs, 76-1112
Residues/water
Estuaries/marshes, 76-0888
Spectrometry
Mass spectrometry, 76-1334
Toxicity/experimental animals
Crustacea, 76-0994
Plankton/algae, 76-0997
Toxicity/non-target organisms
Birds, 76-0917
Eggs, 76-0917

DDT
see also Organochlorines
Amino acids/peptides/proteins
Human, 76-1020
In vitro, 76-1497
Behavior
Animals/experimental, 76-1024 76-1545
Bioassay, 76-1581

DDT (cont'd)
Biotransformation
Microorganisms, 76-1000
Rat, 76-0920
Carbohydrates
Animals/experimental, 76-0970
Chromatography
Gas-liquid, 76-1325, 76-1334 76-1567
Gel permeation, 76-1565
Distribution/storage
Cow, 76-1246
Fish, 76-0942
Human, 76-1143
Molluscs, 76-1008
Mouse, 76-0929
Plants, 76-1523
Rat, 76-1036
Embryo/fetus
Animals/experimental, 76-1045
In vitro, 76-1493
Environmental pollution, 76-0848
Enzyme activity
General, 76-1036, 76-1038
glucose-6-phosphate dehydrogenase, 76-0987
Mixed function oxidases, 76-0966 76-1472, 76-1503, 76-1503
Factors influencing metabolism/toxicity
Adaptation, 76-1462
Interactions, 76-0947, 76-1020
Temperature, 76-1462
Growth
Microorganisms, 76-1215, 76-1257 76-1464
Heart
Animals/experimental, 76-1226
Kidney
Animals/experimental, 76-0961
Lipids/steroids/sterols
Animals/experimental, 76-0920 76-1020
Liver
Animals/experimental, 76-0920 76-1038
In vitro, 76-1493
Lysosomes
In vitro, 76-1297
Metabolism
Rat, 76-0961
Mutagenesis/teratogenesis
Animals/experimental, 76-1503
Nervous system
Animals/experimental, 76-1462
Placental transfer
Animals/experimental, 76-1036
Reproduction/growth
Animals/experimental, 76-0929 76-1503
Reproductive organs, male
In vitro, 76-1497
Residue degradation
Food and feed, 76-1407
Residue removal
Food and feed, 76-0902
Soil, 76-1366

DDT (cont'd)
Water, 76-1118
Residues/food and feed
General, 76-0873
Fruits, 76-1412
Meat, 76-0902, 76-1411
Vegetables, 76-1397, 76-1412
Residues/humans
General, 76-0873, 76-1143
76-1362
Blood, 76-1369, 76-1388
Milk, 76-1411
Residues/non-target organisms
Birds, 76-0872
Duck, 76-1378
Eagle, 76-1378
Fish, 76-0872, 76-1112, 76-1153
Goose, 76-1378
Molluscs, 76-1112
Residues/plants
Cotton, 76-1146
Tobacco, 76-0853, 76-1152
Residues/water
General, 76-0873
Estuaries/marshes, 76-0888
Respiration, cellular
Plants, 76-1013
Reviews
Toxicology and pharmacology
76-1462
Safety standards
TLV/MAC, 76-1436
Spectrometry
Atomic absorption/emission
76-1312
Mass spectrometry, 76-1334
76-1567
Raman, 76-1066
Toxicity/experimental animals
Plankton/algae, 76-0997, 76-1215
Toxicity/humans
Intentional, 76-1020
Occupational, 76-0947
Toxicity/non-target organisms
Crustacea, 76-1418

DDT derived compounds
Biotransformation
Insects, 76-1505
Spectrometry
Raman, 76-1066

DDT isomers
Analysis
Sample preparation, 76-1069
Chromatography
Gas-liquid, 76-1062
Thin-layer, 76-1342
Enzyme activity
Ornithine decarboxylase, 76-0967
Experimental design
Monitoring and residues, 76-1364
76-1365
Factors influencing metabolism/
toxicity
Interactions, 76-0967, 76-1558
Golgi apparatus
In vitro, 76-1496

DDT isomers (cont'd)
Hormones
In vitro, 76-1195
Liver
In vitro, 76-1496
Lysosomes
In vitro, 76-1496
Metabolism
Rat, 76-1558
Reproductive organs, female
Animals/experimental, 76-0967
Residues/air
Rural, 76-1375
Residues/humans
Blood, 76-1376
Residues/water
General, 76-1359
Oceans/seas, 76-1365
Toxicity/humans
Occupational, 76-1376

Deet
see also Repellents
Skin
Animals/experimental, 76-1563
Toxicity/experimental animals
General, 76-1563

DEF
see also Herbicides
Digestive glands
Animals/experimental, 76-0952
Enzyme activity
General, 76-0952
Residues/air
Vehicle, 76-0857

DETA-1
see **Deet**

Dexon
see Fenaminosulf

DFP
see also Organophosphates
Amino acids/peptides/proteins
In vitro, 76-0955
Cytological effects
In vitro, 76-0990
Embryo/fetus
Animals/experimental, 76-1037
Enzyme activity
Cholinesterase, 76-1037, 76-1512
Phosphodiesterase, 76-0990
Renal hydrolase, 76-0955
Urokinase, 76-0956
Factors influencing metabolism/
toxicity
Age, 76-1037
Lysosomes
In vitro, 76-0955
Peripheral nerves
Animals/experimental, 76-1465

Di-allate
see also Carbamates; Herbicides
Biotransformation
Microorganisms, 76-1475

Diazinon
see also Organophosphates
Bioassay, 76-1581
Biotransformation
In vitro, 76-1282
Distribution/storage
Human, 76-1168
Enzyme activity
Alkaline phosphatase, 76-1229
ATPase, 76-1229
Succinic dehydrogenase, 76-1229
Kidney
Animals/experimental, 76-1229
Liver
Animals/experimental, 76-1229
In vitro, 76-1282
Reproductive organs, male
Animals/experimental, 76-1229
Residue degradation
Food and feed, 76-1109
Soil, 76-1109
Residues/food and feed
Cereals, 76-1119
Fruits, 76-1119
Toxicity/experimental animals
Goat, 76-1193
Toxicity/humans
Intentional, 76-1168

1,2-Dibromo-3-chloropropane
see also Fumigants
Residues/soil
Adsorption, 76-1123

Dicamba
see also Herbicides
Residues/water
Groundwater/rain, 76-0895
Toxicity/humans
Accidental, 76-1002
Toxicity/non-target organisms
General, 76-1002

Dichlobenil
see also Herbicides
Growth
Microorganisms, 76-1556
Toxicity/experimental animals
Microorganisms, 76-1004

Dichlofluanid
see also Fungicides
Residues/food and feed
Fruits, 76-1151

Dichlone
see also Fungicides
Biotransformation
Rat, 76-0921
Factors influencing metabolism/
toxicity
Interactions, 76-0921
Liver
Animals/experimental, 76-0921
Porphyrins
Animals/experimental, 76-0921

Dichloran
see also Fungicides; Herbicides
Biotransformation

Dichloran (cont'd)
Rat, 76-1033
Growth
Microorganisms, 76-1007
Toxicity/experimental animals
Microorganisms, 76-1007

Dichloran derived compounds
Mitochondria
In vitro, 76-1033

3,6-Dichloropicolinic acid
see also Herbicides
Chromatography
Gas-liquid, 76-1584

Dichlorvos
see also Organophosphates
Amino acids/peptides/proteins
Animals/experimental, 76-1485
Blood vessels
Animals/experimental, 76-1210
Brain
Animals/experimental, 76-1034
Carcinogenesis
Human, 76-1438, 76-1438
Chromosomes/genes
Plants, 76-0988
Cytological effects
Animals/experimental, 76-1274
EEG
Animals/experimental, 76-1275
Embryo/fetus
Animals/experimental, 76-1037
Enzyme activity
Cholinesterase, 76-1034, 76-1037
76-1275, 76-1277, 76-1532
Excretory system
Animals/experimental, 76-1210
Factors influencing metabolism/
toxicity
Age, 76-1037
Fertility/sterility
Animals/experimental, 76-0923
76-1467
Heart
Animals/experimental, 76-1275
Kidney
Animals/experimental, 76-1274
Liver
Animals/experimental, 76-1274
Metabolism
Pig, 76-1530
Mutagenesis/teratogenesis
Plants, 76-0988
Peripheral nerves
Human, 76-1532
Respiratory system
Animals/experimental, 76-1210
Toxicity/experimental animals
Goat, 76-1193
Mouse, 76-0928
Toxicity/humans
Experimental, 76-1532
Vision
Animals/experimental, 76-1274
76-1277

Dicofol
see also Organochlorines
Residues/food and feed
Cereals, 76-1119
Fruits, 76-1119

Dicotex
see MCPA

Dicrotophos
see also Organophosphates
Enzyme activity
Cholinesterase, 76-0924
Mutagenesis/teratogenesis
In vitro, 76-0924
Toxicity/experimental animals
Goat, 76-1193

Dicryl
see also Herbicides
Chromatography
Gas-liquid, 76-1055

Dieldrin
see also Organochlorines
Absorption
Rat, 76-1231
Analysis
Sample preparation, 76-1069
Biotransformation
Microorganisms, 76-1299
Brain
Animals/experimental, 76-1549
Chromatography
Gas-liquid, 76-1062, 76-1073
76-1325, 76-1334
Cytological effects
Animals/experimental, 76-1549
Distribution/storage
Crustacea, 76-1009
Fish, 76-0942
Molluscs, 76-1008, 76-1009
Mouse, 76-0929
Rat, 76-1231
Eggshell effects
Animals/non-target, 76-0917
Factors influencing metabolism/
toxicity
Biological magnification, 76-1009
Golgi apparatus
In vitro, 76-1496
Growth
Microorganisms, 76-1257
Heart
Animals/experimental, 76-1226
Laws and regulations
USA-EPA, 76-1426
Liver
In vitro, 76-1496
Lysosomes
In vitro, 76-1496
Metabolism
Fish, 76-0964
Reproduction/growth
Animals/experimental, 76-0929
Residue degradation
Soil, 76-1370
Residues/food and feed
Animal feed, 76-1374

Dieldrin (cont'd)
Dairy products, 76-1374
Fruits, 76-1412
Vegetables, 76-1412
Residues/humans
General, 76-1362
Blood, 76-1376
Residues/plants
Tobacco, 76-1152
Residues/soil
General, 76-1370
Spectrometry
Mass spectrometry, 76-1334
Raman, 76-1066
Spinal cord
Animals/experimental, 76-0949
Toxicity/experimental animals
Crustacea, 76-0994
Plankton/algae, 76-0997
Toxicity/humans
Intentional, 76-1020
Occupational, 76-1174, 76-1376
Toxicity/non-target organisms
Birds, 76-0917
Eggs, 76-0917
Treatment of poisoning
Diet, 76-1174

Dieldrin derived compounds
Toxicity/experimental animals
Plankton/algae, 76-0997

Difluron
see also Fluorine compounds
Growth
Animals/non-target, 76-1291
Toxicity/experimental animals
Crustacea, 76-1291
Insects, 76-1291

Dimethatryne
see also Herbicides
Toxicity/experimental animals
General, 76-1560

Dimethirimol
see also Fungicides
Toxicity/experimental animals
General, 76-1547

Dimethoate
see also Organophosphates
Enzyme activity
Cholinesterase, 76-1524, 76-1535
Growth
Microorganisms, 76-1464
Mitosis/meiosis
Animals/experimental, 76-1213
Nervous system
Animals/experimental, 76-1264
Residue removal
Water, 76-1118
Residues/air
Vehicle, 76-0857
Toxicity/experimental animals
Fish, 76-1264

O,O-Dimethyl 2,2,2-trichloro-1-N-dodecanoyloxy ethyl phosphonate
see Lauroyl trichlorfon

Dinoseb acetate
see also Herbicides
Growth
Microorganisms, 76-1288
Respiration, cellular
Microorganisms, 76-1288
Toxicity/experimental animals
Microorganisms, 76-1288

Dioxins
see also 2,4,5-T
Amino acids/peptides/proteins
Animals/experimental, 76-0959
In vitro, 76-0958
Biotransformation
Rat, 76-0969
Chromatography
Gas-liquid, 76-1083
Distribution/storage
Monkey, 76-1521
Rat, 76-0969, 76-1521
Endoplasmic reticulum
Animals/experimental, 76-0940
Enzyme activity
General, 76-0969
Aldehyde dehydrogenase, 76-0959
Aryl hydrocarbon hyproxylase 76-0958
Mixed function oxidases, 76-0940 76-0978
Factors influencing metabolism/ toxicity
Age, 76-1521
Pregnancy, 76-0969
Taxon, 76-1521
Immunology
Animals/experimental, 76-1236
Liver
Animals/experimental, 76-0940 76-0959
Microsomes
Animals/experimental, 76-0940
Placental transfer
Animals/experimental, 76-0969
Porphyrins
Animals/experimental, 76-0978

Diphacinone
see also Rodenticides
Distribution/storage
Cow, 76-1239

Diphenadione
see Diphacinone

Diphenamid
see also Herbicides
Residues/food and feed
Vegetables, 76-1392

Dipterex
see Trichlorfon

Diquat
see also Herbicides
Distribution/storage

Diquat (cont'd)
In vitro, 76-1480
Growth
Microorganisms, 76-1556
Toxicity/experimental animals
Microorganisms, 76-1004

Disulfoton
see also Organophosphates
Brain
Animals/experimental, 76-1466
Catecholamines
Animals/experimental, 76-1466
Growth
Microorganisms, 76-1224
Residue degradation
Soil, 76-0900
Residues/food and feed
Fruits, 76-1138
Toxicity/experimental animals
Microorganisms, 76-1224
Vision
Animals/experimental, 76-1522

Disyston
see Disulfoton

Diuron
see also Herbicides
Bioassay, 76-1087
Chromatography
Gas-liquid, 76-1072
Growth
Microorganisms, 76-1556
Residue removal
Water, 76-1118
Residues/soil
Movement, 76-0862
Spectrometry
Mass spectrometry, 76-1072
Toxicity/experimental animals
Microorganisms, 76-1004

DMTHF
see Trichlorfon

DNOC
see also Fungicides
Chromatography
Thin-layer, 76-1327
Factors influencing metabolism/ toxicity
Temperature, 76-1553

Dosanex
see Metoxuron

Dowco 290
see 3,6-Dichloropicolinic acid

Drazoxolon
see also Fungicides
Growth
Microorganisms, 76-1007
Toxicity/experimental animals
Microorganisms, 76-1007

Endosulfan
see also Organochlorines
Nervous system
Animals/experimental, 76-1264
Residue removal

Endosulfan (cont'd)
Water, 76-1118
Residues/food and feed
Vegetables, 76-1397
Residues/plants
Tobacco, 76-0853, 76-1152
Spectrometry
Raman, 76-1066
Toxicity/experimental animals
Fish, 76-1264
Toxicity/humans
Accidental, 76-1167
Intentional, 76-1167

Endothall
see also Herbicides
Factors influencing metabolism/ toxicity
Interactions, 76-0999
Metabolism
Plants, 76-0999

Endrin
see also Organochlorines
Analysis
Sample preparation, 76-1069
Bioassay, 76-1331, 76-1581
Biotransformation
Mouse, 76-1032
Chromatography
Thin-layer, 76-1316
Factors influencing metabolism/ toxicity
Taxon, 76-1032
Growth
Microorganisms, 76-1257
Nervous system
Animals/experimental, 76-1264
Residues/food and feed
Fruits, 76-1412
Vegetables, 76-1412, 76-1581
Residues/plants
Tobacco, 76-0853, 76-1152
Spectrometry
Raman, 76-1066
Toxicity/experimental animals
Fish, 76-1264
Plankton/algae, 76-0997

EPTC
see also Carbamates; Herbicides
Biotransformation
Plants, 76-1243
Chromatography
Gas-liquid, 76-1067
Embryo/fetus
Animals/experimental, 76-0951
Enzyme activity
Ribonuclease, 76-0951
Fertility/sterility
Animals/experimental, 76-0951
Gonads
Animals/experimental, 76-0951

Ethephon
see also Organophosphates
Biotransformation
Plants, 76-1245
Factors influencing metabolism/

Ethephon (cont'd)
toxicity
Interactions, 76-0999
Metabolism
Plants, 76-0999

Ethiophencarp
see also Carbamates
Metabolism
Rat, 76-1244

Ethylene dibromide
see also Fumigants
Distribution/storage
Guinea pig, 76-1296
Residues/food and feed
Cereals, 76-1145

Ethylene thiourea
see also Fungicides
Biotransformation
Rat, 76-1030
Factors influencing metabolism/toxicity
Pregnancy, 76-1030
Mutagenesis/teratogenesis
Animals/experimental, 76-1030
Placental transfer
Animals/experimental, 76-1030

Ethylthiometon
see Disulfoton

Famphur
see also Organophosphates
Chromatography
Gas-liquid, 76-1583
Toxicity/experimental animals
Reindeer, 76-1307

Fenaminosulf
see also Fungicides
Biotransformation
Pseudomonas fragi, 76-1011
Enzyme activity
General, 76-0989
Toxicity/experimental animals
Microorganisms, 76-0989

Fenchlorphos
see Ronnel

Fenitrothion
see also Organophosphates
Blood vessels
Animals/experimental, 76-1210
Chromatography
Gas-liquid, 76-1329
Digestive system
Animals/experimental, 76-1502
Embryo/fetus
Animals/experimental, 76-1489
Enzyme activity
General, 76-1502
Cholinesterase, 76-0950
Excretory system
Animals/experimental, 76-1210
Factors influencing metabolism/toxicity
Sex, 76-0974
Immunology

Fenitrothion (cont'd)
Animals/experimental, 76-1526
Metabolism
Dog, 76-1538
Mouse, 76-1538
Rabbit, 76-1538
Rat, 76-1538
Muscle, striated
Animals/experimental, 76-0950
Mutagenesis/teratogenesis
Animals/experimental, 76-1489
Residue dynamics, 76-0854
Residues/water
Rivers/streams, 76-0854
Respiratory system
Animals/experimental, 76-1210
Toxicity/experimental animals
General, 76-0974
Quail, 76-1201
Rat, 76-1200
Vision
Animals/experimental, 76-1486

Fenitrothion derived compounds
Biotransformation
General, 76-1232
Toxicity/experimental animals
Rat, 76-1200

Fenitroxon
see Organophosphates

Fensulfothion
see also Organophosphates
Factors influencing metabolism/toxicity
Interactions, 76-1190
Residues/food and feed
Vegetables, 76-1409

Fenthion
see also Organophosphates
Residues/plants
Tobacco, 76-0909
Toxicity/humans
Intentional, 76-1177
Occupational, 76-0909
Treatment of poisoning
Atropine, 76-1177
Pralidoxime, 76-1177
Vision
Animals/experimental, 76-1486

Fenuron
see also Herbicides
Toxicity/experimental animals
Guinea pig, 76-0984
Rat, 76-0984

Ferbam
see also Fungicides
Fertility/sterility
Animals/experimental, 76-1035
Growth
Animals/experimental, 76-1035

Fluometuron
see also Fluorine compounds
Residues/soil
Adsorption, 76-0866
Movement, 76-0862, 76-0866

Fluorine compounds
see Difluron; Fluometuron; Trifluralin

Folcidin
see Cypendazole

Folpet
see also Fungicides
Chromatography
Gas-liquid, 76-1336
Residues/food and feed
Fruits, 76-1151

Formothion
see also Organophosphates
Residue degradation
Food and feed, 76-1373

Fosfotex
see also Organophosphates
Toxicity/humans
Accidental, 76-1298

Fospirate
see also Organophosphates
Toxicity/experimental animals
Mouse, 76-0928

Fumigants
see also Carbon tetrachloride; 1,-2-Dibromo-3-chloropropane; Ethylene dibromide; Hexachlorobutadiene; Hydrogen cyanide; Methyl bromide; Phosphine; Trichloroethylene
Residues/soil
General, 76-0941

Fungicides
see also Benomyl; Biphenyl; Bordeaux mixture; Captafol; Captan; Carbendazim; Carboxin; Chloraniformethane; Chloroneb; Copper; Copper sulfate; Cypendazole; Dichlofluanid; Dichlone; Dichloran; Dimethirimol; DNOC; Drazoxolon; Ethylene thiourea; Fenaminosulf; Ferbam; Folpet; Hexachlorobenzene; Maneb; Manocozeb; Norflurazon; Oryzemate; Oxycarboxin; Oxythioquinox; PCNB; Phthalide; Polyoxin A; Polyoxin B; Thiabendazole; Thiophanate-methyl Thiram; Triarimol; Triforine; Zineb; Ziram
Alternative controls, 76-0846
Chromatography
Column, 76-1060
Gas-liquid, 76-1046
Chromosomes/genes
In vitro, 76-1216
Environmental pollution, 76-0846
Experimental design
Toxicology and pharmacology 76-1216
Nucleic acids
In vitro, 76-1216
Photodecomposition, 76-1149

Fungicides (cont'd)
Residues/food and feed
Cereals, 76-1119
Fruits, 76-1119
Residues/water
Wastewater, 76-0882
Respiration, cellular
Microorganisms, 76-1255
Spectrometry
Mass spectrometry, 76-1046
Toxicity/experimental animals
Fish, 76-1546
Microorganisms, 76-1255

GC-6506
see also Organophosphates
Toxicity/experimental animals
Mouse, 76-0928

Gliftor
see also Rodenticides
Nervous system
Human, 76-1430
Respiratory system
Human, 76-1430
Toxicity/humans
Accidental, 76-1430

Glyphosate
see also Herbicides
Residues/water
Groundwater/rain, 76-1161

GS-14254
see also Herbicides
Residues/soil
Adsorption, 76-1159

Guthion
see Azinphosmethyl

Heavy metals
see Cadmium; Copper; Lead

Hempa
see also Chemosterilants
Factors influencing metabolism/toxicity
Disease state, 76-1187
Respiratory system
Animals/experimental, 76-1187

Heptachlor
see also Organochlorines
Chromatography
Gel permeation, 76-1565
Growth
Microorganisms, 76-1257
Laws and regulations
USA-EPA, 76-1184
Residues/food and feed
General, 76-1416
Residues/water
Groundwater/rain, 76-0895
Spectrometry
Raman, 76-1066
Toxicity/experimental animals
Fish, 76-1300
Molluscs, 76-1300

Heptachlor epoxide
see also Organochlorines
Chromatography
Gas-liquid, 76-1062, 76-1325
Residues/food and feed
General, 76-1416
Animal feed, 76-1374
Dairy products, 76-1374
Toxicity/experimental animals
Fish, 76-1300
Molluscs, 76-1300

Herbicides
see also Amitrole; Asulam; Atrazine; Benefin; Bensulide; Benthiocarb; Bifenox; Bromacil; Bromoxynil; Butralin; Butylate; Chloramben; Chlormequat chloride; Chlorpropham; 2,4-D Dalapon; Daminozide; 2,4-DB; DEF; Di-allate; Dicamba; Dichlobenil; Dichloran; 3,-6-Dichloropicolinic acid; Dicryl; Dimethatryne;piperophos; Dinoseb acetate; M_{13}; Diphenamid; Diquat; Diuron; Endothall; EPTC; Fenuron; Glyphosate; GS-14254; Ioxynil; Linuron; Maleic hydrazide; MCPA; Methabenzthiazuron; Metobromuron; Metoxuron; Metribuzin; Molinate; MSMA; Napropamide; Nitralin; Nitrofen; Paraquat; PCP; Picloram; Prometryne; Propachlor; Propanil; Propham; Prynachlor Pyrazon; Ro-neet; Simazine; Sodium chloride; 2,4,5-T; TCA; Terbutryne; Trifluralin
Alternative controls, 76-0846
Bioassay, 76-1568
Biotransformation
General, 76-1268
Microorganisms, 76-0907, 76-1561
Carcinogenesis
Human, 76-1185, 76-1442
Chromatography
General, 76-1568
Column, 76-1314
Gas-liquid, 76-1047, 76-1057, 76-1077
Chromosomes/genes
In vitro, 76-1216
Cytological effects
In vitro, 76-1214
Economics, 76-1345
Electrometry
Conductometry, 76-1318
Environmental pollution, 76-0846 76-1345
Experimental design
Toxicology and pharmacology 76-1216
Factors influencing metabolism/toxicity
General, 76-0932

Herbicides (cont'd)
Taxon, 76-1470
Gonads
Animals/experimental, 76-1470
Morbidity and mortality statistics
Sweden, 76-1185
Nucleic acids
In vitro, 76-1216
Prevention
General, 76-1182
Reproduction/growth
Animals/experimental, 76-1491
Animals/non-target, 76-1491
Residue degradation
Soil, 76-1129
Residue removal
Water, 76-0890
Residues/non-target organisms
General, 76-0932
Residues/soil
General, 76-1131
Residues/water
Groundwater/rain, 76-0885
Lakes/ponds, 76-0932
Rivers/streams, 76-0932
Wastewater, 76-0882
Respiration, cellular
Microorganisms, 76-1255
Spectrometry
Mass spectrometry, 76-1047, 76-1077
Toxicity/experimental animals
Fish, 76-1546
Microorganisms, 76-1255
Toxicity/humans
Occupational, 76-0907, 76-1185 76-1442
Toxicity/non-target organisms
General, 76-1182
Molluscs, 76-0912
Plankton/algae, 76-0912
Treatment of poisoning
General, 76-1182

Hexachlorobenzene
see also Fungicides
Absorption
Rat, 76-1231
Distribution/storage
Cow, 76-1251
Rabbit, 76-1228
Rat, 76-1231
Enzyme activity
GOT, 76-0968
Mixed function oxidases, 76-0968
Excretion
Cow, 76-1251
Factors influencing metabolism/toxicity
Formulation, 76-0930
Interactions, 76-0968
Liver
Animals/experimental, 76-1188
Metabolism
Rat, 76-0930, 76-0968
Placental transfer
Animals/experimental, 76-1228
Porphyrins
Animals/experimental, 76-0968

Hexachlorobenzene (cont'd)
Residues/food and feed
General, 76-1415
Residues/non-target organisms
General, 76-1377

Hexachlorobutadiene
see also Fumigants
Spectrometry
Colorimetry, 76-1587
UV, 76-1587
Toxicity/experimental animals
Mouse, 76-1531
Rat, 76-1531

Hexamethylphosphoramide
see Hempa

Hormit
see 2,4-D

Hydrogen cyanide
see also Fumigants
Residues/food and feed
Cereals, 76-1389

Hypobovin
see Dimethoate

Imugan
see Chloraniformethane

Intrathion
see Thiometon

Ioxynil
see also Herbicides
Biotransformation
Microorganisms, 76-1218

Isodrin
see also Organochlorines
Biotransformation
Monkey, 76-0945
Rat, 76-0945

Isophenphos
see also Organophosphates
Factors influencing metabolism/toxicity
Interactions, 76-1190

Juvenile hormones and analogs
see also Methoprene
Alternative controls, 76-1349
Biotransformation
Microorganisms, 76-1299
Residue degradation
General, 76-1253
Toxicity/experimental animals
Bee, 76-0922

Landrin
see also Carbamates
Toxicity/experimental animals
Insects, 76-1227
Plants, 76-1227

Lauroyl trichlorfon
see also Organophosphates
Residue dynamics, 76-1380
Residues/non-target organisms
Plants, 76-1380

Lead
see also Heavy metals
Environmental pollution, 76-1350
Residues/humans
General, 76-1404

Leptophos
see also Organophosphates
Enzyme activity
Cholinesterase, 76-0950
Succinic dehydrogenase, 76-1203
Metabolism
General, 76-1290
Muscle, striated
Animals/experimental, 76-0950
Nervous system
Animals/experimental, 76-0977
Animals/non-target, 76-1165
Vitamins/coenzymes
In vitro, 76-1203

Lindane
see also Organochlorines
Amino acids/peptides/proteins
Human, 76-1020
Microorganisms, 76-1309
Biotransformation
Microorganisms, 76-0926, 76-1537
Plankton/algae, 76-1150
Carcinogenesis
Human, 76-1438
Chromatography
Gas-liquid, 76-1062
Gel permeation, 76-1565
Electrometry
Polarography, 76-1574
Enzyme activity
General, 76-1287, 76-1492
Glucose-6-phosphate dehydrogenase, 76-0987
Mixed function oxidases, 76-0927
Factors influencing metabolism/toxicity
Adaptation, 76-0927, 76-1462
Interactions, 76-0947, 76-1020 76-1020
Nutritional state, 76-1537
Temperature, 76-1462
Golgi apparatus
In vitro, 76-1496
Growth
Microorganisms, 76-1495
Liver
Animals/experimental, 76-1492
In vitro, 76-1496
Lysosomes
In vitro, 76-1496
Metabolism
Plants, 76-1016
Musculoskeletal system
Animals/experimental, 76-1492
Mutagenesis/teratogenesis
Human, 76-1438
Nervous system
Animals/experimental, 76-1462
Residue removal
Water, 76-1150
Residues/food and feed

Lindane (cont'd)
General, 76-0873, 76-1416
Residues/humans
General, 76-0873
Residues/water
General, 76-0873
Respiration, cellular
Microorganisms, 76-1309, 76-1528
Reviews
Toxicology and pharmacology 76-1462
Safety standards
TLV/MAC, 76-1436
Toxicity/experimental animals
Microorganisms, 76-1495
Toxicity/humans
Intentional, 76-1020
Occupational, 76-0947

Linuron
see also Herbicides
Bioassay, 76-1087
Chromatography
Gas-liquid, 76-1072
Spectrometry
Mass spectrometry, 76-1072

M_{11}
see also Herbicides
Biotransformation
Microorganisms, 76-1189
Sheep, 76-1189

Malathion
see also Organophosphates
Bioassay, 76-1581
Chromatography
Column, 76-1068
Digestive system
Animals/experimental, 76-1502
Enzyme activity
General, 76-1502
Cholinesterase, 76-0924, 76-1512 76-1539
Mixed function oxidases, 76-1235
Factors influencing metabolism/toxicity
Adaptation, 76-1539
Interactions, 76-0947
Fertility/sterility
Animals/experimental, 76-1467
Growth
Microorganisms, 76-1215, 76-1306 76-1464
Liver
Animals/experimental, 76-1235
Mutagenesis/teratogenesis
In vitro, 76-0924
Residue removal
Food and feed, 76-1398
Water, 76-1118
Residues/food and feed
Cereals, 76-1119
Fruits, 76-1119
Vegetables, 76-1398, 76-1581
Toxicity/experimental animals
Fish, 76-1264
Goat, 76-1193
Microorganisms, 76-1306

Malathion (cont'd)
Plankton/algae, 76-1215
Rat, 76-1543
Toxicity/humans
Accidental, 76-1298
Occupational, 76-0947

Maleic hydrazide
see also Herbicides
Spectrometry
Colorimetry, 76-1571

Mancozeb
see also Carbamates
Residue degradation
Soil, 76-1383
Residues/food and feed
Fruits, 76-1151

Maneb
see also Carbamates; Fungicides
Immunology
Animals/experimental, 76-1042

Manocozeb
see Fungicides

Maqbarl
see also Carbamates
Residue degradation
General, 76-0851
Residues/non-target organisms
General, 76-0851

2-MBA
see Carbendazim

MBC
see Carbendazim

MCPA
see also Herbicides
Gonads
Animals/experimental, 76-1525

MCPCA
Toxicity/experimental animals
Mouse, 76-1552
Rat, 76-1552

Menazon
see also Organophosphates
Growth
Microorganisms, 76-1464

Mercurials
Amino acids/peptides/proteins
In vitro, 76-0955, 76-1207
Environmental pollution, 76-0848
Enzyme activity
Renal hydrolase, 76-0955
Lysosomes
In vitro, 76-0955
Mitosis/meiosis
Plants, 76-1498
Morbidity and mortality statistics
Japan, 76-1175
Prevention
General, 76-1182
Reproduction/growth
Animals/experimental, 76-1491
Animals/non-target, 76-1491
Residue dynamics, 76-1115

Mercurials (cont'd)
Residues/non-target organisms
Birds, 76-0872
Duck, 76-1378
Eagle, 76-1378
Fish, 76-0872, 76-1153, 76-1371
Goose, 76-1378
Safety standards
TLV/MAC, 76-1454
Toxicity/non-target organisms
General, 76-1182
Treatment of poisoning
General, 76-1182
Dialysis, 76-1136

Mesurol
see Methiocarb

Metaldehyde
see also Molluscicides
Chromatography
Gas-liquid, 76-1054

Metaphos
see Methyl parathion

Metathion
see Fenitrothion

Methabenzthiazuron
see also Herbicides
Analysis
Sample preparation, 76-1322
Embryo/fetus
Animals/experimental, 76-1468
Titration, 76-1340
Toxicity/experimental animals
Frog, 76-1468

Methamidophos
see also Organophosphates
Residue degradation
Food and feed, 76-1401
Toxicity/experimental animals
General, 76-1551

Methidathion
see also Organophosphates
Toxicity/humans
Intentional, 76-1423
Treatment of poisoning
Atropine, 76-1423
Toxogonin, 76-1423

Methiocarb
see also Carbamates
Distribution/storage
Rat, 76-0939
Factors influencing metabolism/toxicity
Pregnancy, 76-0939
Placental transfer
Animals/experimental, 76-0939
Spectrometry
Infrared, 76-1321
Mass spectrometry, 76-1321
NMR, 76-1321

Methomyl
see also Carbamates
Residues/food and feed
Vegetables, 76-1141

Methomyl (cont'd)
Toxicity/experimental animals
Insects, 76-1227
Plants, 76-1227

Methoprene
see also Juvenile hormones and analogs
Metabolism
Chicken, 76-0963

Methoxychlor
see also Organochlorines
Absorption
Fungi, 76-1204
Plankton/algae, 76-1204
Biotransformation
Mouse, 76-1505
Residue degradation
Food and feed, 76-1407

Methyl bromide
see also Fumigants
Residues/food and feed
Cereals, 76-1389
Toxicity/humans
Accidental, 76-1440
Treatment of poisoning
Oxygen, 76-1440

2-Methyl-4-chlorophenoxyacetic anilide
see MCPA

Methyl demeton
see also Organophosphates
Residues/air
Vehicle, 76-0857

Methyl parathion
see also Organophosphates
Bioassay, 76-1581
Biotransformation
Microorganisms, 76-1122
Enzyme activity
Cholinesterase, 76-1524
Mixed function oxidases, 76-1469
Factors influencing metabolism/toxicity
Sex, 76-0974
Temperature, 76-1553
Immunology
Animals/experimental, 76-1042
Residue degradation
Soil, 76-1122
Residues/air
Rural, 76-1375
Residues/food and feed
Vegetables, 76-1581
Residues/plants
Cotton, 76-1146
Toxicity/experimental animals
General, 76-0974

Methylbenzimidazole carbamate
see Carbendazim

Methylnirophos
see Fenitrothion

Metobromuron
see also Herbicides
Chromatography

Metobromuron (cont'd)
Thin-layer, 76-1393
Residue degradation
Soil, 76-1393

Metoxuron
see also Herbicides
Chromatography
Gas-liquid, 76-1072
Embryo/fetus
Animals/experimental, 76-1468
Spectrometry
Mass spectrometry, 76-1072
Toxicity/experimental animals
Frog, 76-1468

Metribuzin
see also Herbicides
Chromatography
Column, 76-1585
Gas-liquid, 76-1585
Spectrometry
Infrared, 76-1585

Mevinphos
see also Organophosphates
Factors influencing metabolism/toxicity
Interactions, 76-0931
Peripheral nerves
Animals/experimental, 76-1293

Mexacarbate
see also Carbamates
Distribution/storage
Rat, 76-0939
Factors influencing metabolism/toxicity
Pregnancy, 76-0939
Placental transfer
Animals/experimental, 76-0939
Toxicity/experimental animals
Plankton/algae, 76-0997

Microbials
see also Beauveria bassiana
Safety standards
General, 76-1169

Mil-col
see Drazoxolon

Milcurb
see Dimethirimol

Mipafox
see also Organophosphates
Enzyme activity
Cholinesterase, 76-0950
Muscle, striated
Animals/experimental, 76-0950

Mirex
see also Organochlorines
Bile
Animals/experimental, 76-0965
Biotransformation
Monkey, 76-1488
Cytological effects
Animals/experimental, 76-1514

Mirex (cont'd)
Distribution/storage
Rat, 76-1520
Excretion
Rat, 76-0965
Factors influencing metabolism/toxicity
Interactions, 76-0965
Liver
Animals/experimental, 76-1514
Mutagenesis/teratogenesis
Animals/experimental, 76-1520
Reproduction/growth
Animals/experimental, 76-1520
Residue dynamics, 76-0863
Residues/non-target organisms
Birds, 76-0863
Fish, 76-0863

Mirex derived compounds
Excretion
Monkey, 76-1488

Molinate
see also Herbicides
Embryo/fetus
Animals/experimental, 76-0951
Enzyme activity
Ribonuclease, 76-0951
Fertility/sterility
Animals/experimental, 76-0951
Gonads
Animals/experimental, 76-0951
Residues/water
Lakes/ponds, 76-0859

Molluscicides
see Metaldehyde; Trifenmorph

Monitor
see Methamidophos

Monocrotophos
see also Organophosphates
Embryo/fetus
Animals/experimental, 76-1500
Factors influencing metabolism/toxicity
Taxon, 76-1499
Mutagenesis/teratogenesis
Animals/experimental, 76-1499 76-1500

MSMA
see also Herbicides
Residue degradation
Soil, 76-1157

Naled
see also Organophosphates
Toxicity/experimental animals
Mouse, 76-0928

1-Naphthol
see Carbamates

Napropamide
see also Herbicides
Toxicity/experimental animals
General, 76-1560, 76-1560

Nemacur
see Phenamiphos

Nemaphos
see Thionazin

Nematocides
see Oxamyl; Phenamiphos

Nitralin
see also Herbicides
Residue degradation
Soil, 76-0899

Nitrapyrin
see also Soil bactericides
Residue degradation
Soil, 76-0856
Residues/soil
Volatilization, 76-0856

***p*-Nitrocresol**
see Fenitrothion derived compounds

Nitrofen
see also Herbicides
Factors influencing metabolism/toxicity
Interactions, 76-1190

NK-493
see Phenproxide

Norflurazon
see also Fungicides
Porphyrins
Plants, 76-1286

NS 2662
see also Organophosphates
Amino acids/peptides/proteins
Animals/experimental, 76-1485

Organochlorines
see also Aldrin; BHC ; Chlordane; DDE; DDT; Dicofol Dieldrin; Endosulfan; Endrin; Heptachlor; Heptachlor epoxide; Isodrin; Lindane; Methoxychlor; Mirex; Polychloropinene; TDE; Tetradifon Toxaphene
Alternative controls, 76-0846
Analysis
General, 76-1080
Sample preparation, 76-1064 76-1088, 76-1575
Biotransformation
General, 76-1268
Microorganisms, 76-0907
Carcinogenesis
Human, 76-1442
Chromatography
General, 76-1056
Column, 76-1333
Gas-liquid, 76-1064, 76-1077 76-1573, 76-1575
Thin-layer, 76-1082
Chromosomes/genes
In vitro, 76-1216
Distribution/storage

Organochlorines (cont'd)
Microorganisms, 76-1448
EEG
Human, 76-1276
Electrolytes
In vitro, 76-0983
Electrometry
Conductometry, 76-1318
Environmental pollution, 76-0846 76-1347
Excretion
Human, 76-1437
Experimental design
Analysis, 76-1088
Toxicology and pharmacology 76-1216
Factors influencing metabolism/ toxicity
Biological magnification, 76-1029 76-1491
Taxon, 76-1470
Temperature, 76-0910
Gonads
Animals/experimental, 76-1470
Growth
Animals/experimental, 76-1305 76-1305
Mitochondria
Animals/experimental, 76-1041
Morbidity and mortality statistics
africa, 76-1439
Columbia, 76-1417
Japan, 76-1175
Neonate
Human, 76-1437
Nervous system
Animals/experimental, 76-1039
Nucleic acids
In vitro, 76-1216
Photodecomposition, 76-1114
Prevention
General, 76-1182
Disposal, 76-0910
Reproduction/growth
Animals/experimental, 76-1491
Animals/non-target, 76-1491
Residue degradation
General, 76-1114
Food and feed, 76-0858
Soil, 76-0858
Water, 76-0858, 76-0880
Residue dynamics, 76-0894, 76-1115
Residues/food and feed
General, 76-1413
Total diet, 76-0850
Dairy products, 76-1358, 76-1361 76-1367, 76-1395, 76-1414
Fruits, 76-1394
Meat, 76-1360
Residues/humans
Adipose, 76-0875
Milk, 76-1358, 76-1363, 76-1406 76-1414
Residues/non-target organisms
Bat, 76-1134
Birds, 76-0875
Crustacea, 76-0898

Organochlorines (cont'd)
Fish, 76-1108, 76-1371
Molluscs, 76-0898
Plankton/algae, 76-0898
Rabbit, 76-1408
Seal, 76-0875
Sheep, 76-0875, 76-0875
Residues/plants
Medicinals and condiments 76-0864, 76-0867
Residues/soil
General, 76-0883
Residues/water
General, 76-0883
Estuaries/marshes, 76-0898
Groundwater/rain, 76-0855 76-0886, 76-0889
Lakes/ponds, 76-0879
Oceans/seas, 76-1117
Rivers/streams, 76-0865, 76-0886 76-1111
Respiration, cellular
Animals/experimental, 76-1041
Reviews
Monitoring and residues, 76-0864
Spectrometry
Mass spectrometry, 76-1077
Thermal decomposition, 76-1114
Toxicity/experimental animals
Cow, 76-1252
Insects, 76-1305, 76-1305
Toxicity/humans
General, 76-1417, 76-1428
Occupational, 76-0907, 76-1276 76-1442, 76-1445
Toxicity/non-target organisms
General, 76-1182
Microorganisms, 76-1448
Treatment of poisoning
General, 76-1182, 76-1439
Vitamins, 76-1445
Vitamins/coenzymes
Animals/experimental, 76-1445
Human, 76-1445

Organophosphates
see also Acephate; Armine; Azinphos-methyl; Azinphosmethyl; Chlorfenvinphos; Chlorpyrifos; Coumaphos; Crufomate; DAEP; DFP; Diazinon; Dichlorvos; Dicrotophos; Dimethoate; Disulfoton; Ethephon; Famphur; Fenitrothion; Fenitroxon; Fensulfothion; Fenthion; Formothion; Fosfotex; Fospirate; GC-6506; Isophenphos; Lauroyl trichlorfon; Leptophos; Malathion; Menazon; Methamidophos; Methidathion; Methyl demeton; Methyl parathion; Mevinphos; Mipafox; Monocrotophos; Naled; Oxinothiophos; Paraoxon; Parathion; Phenthoate; Phorate; Phosmet; Phosphamidon; Phoxim; Pirimiphos-ethyl; Prothiophos;

Organophosphates (cont'd)
Quinalphos; NS 2662 Ronnel; Sarin; Soman; Tetrachlorvinphos; Thiometon; Thionazin; Trichlorfon
Alternative controls, 76-0846
Analysis
General, 76-1080
Sample preparation, 76-1064 76-1328, 76-1575
Balance
Human, 76-1429
Biotransformation
General, 76-1513
In vitro, 76-1533
Microorganisms, 76-0907
Chromatography
General, 76-1056
Column, 76-1586
Gas-liquid, 76-1064, 76-1077 76-1315, 76-1319, 76-1326 76-1575
Thin-layer, 76-1082, 76-1564 76-1569, 76-1588
Cytological effects
In vitro, 76-0971
EEG
Human, 76-1276, 76-1425
Electrometry
Conductometry, 76-1318
Embryo/fetus
Animals/experimental, 76-1482
Environmental pollution, 76-0846
Enzyme activity
General, 76-1178, 76-1422
Cholinesterase, 76-1198, 76-1425 76-1534
Dimethatryne-piperophos 76-1191, 76-1529
Esterases, 76-0971
Enzyme assay
General, 76-1569
Cholinesterase, 76-1586
Factors influencing metabolism/ toxicity
Adaptation, 76-1462
Biological magnification, 76-1491
Structure/function, 76-1541 76-1542
Taxon, 76-1470
Temperature, 76-1462, 76-1513
Gonads
Animals/experimental, 76-1470
Laws and regulations
Japan, 76-1183
World Health Organization 76-1421
Mitochondria
Animals/experimental, 76-1041
Morbidity and mortality statistics
Columbia, 76-1417
Japan, 76-1175, 76-1179
USA, 76-1432
Mutagenesis/teratogenesis
Animals/experimental, 76-1554
Animals/non-target, 76-1491
Nervous system

Organophosphates (cont'd)
Animals/experimental, 76-1176 76-1462
Human, 76-1176
Peripheral nerves
Human, 76-1431
Prevention
General, 76-0914, 76-1182
Reproduction/growth
Animals/experimental, 76-1491
Animals/non-target, 76-1491
Residue degradation
Soil, 76-0870
Residues/food and feed
Fruits, 76-1394
Residues/soil
Movement, 76-0870
Residues/water
Wastewater, 76-0882
Respiration, cellular
Animals/experimental, 76-1041
Reviews
Analysis, 76-1570
Toxicology and pharmacology 76-1462
Spectrometry
Colorimetry, 76-1578
Mass spectrometry, 76-1077
Spinal cord
Animals/experimental, 76-1267
Sympathetic nerves
In vitro, 76-0971
Toxicity/experimental animals
Cat, 76-1198
Cow, 76-1252
Fish, 76-1302
Mouse, 76-1198
Toxicity/humans
General, 76-0914, 76-1417 76-1425, 76-1428
Occupational, 76-0907, 76-1178 76-1179, 76-1276, 76-1421 76-1422, 76-1431, 76-1445
Toxicity/non-target organisms
General, 76-1182
Treatment of poisoning
General, 76-1181, 76-1182
Vitamins, 76-1445
Vision
Human, 76-1179
Vitamins/coenzymes
Animals/experimental, 76-1445 76-1482
Human, 76-1445

Oryzemate
see also Fungicides
Toxicity/experimental animals
Mouse, 76-1451
Rat, 76-1451

Oxamyl
see also Nematocides
Chromatography
Gas-liquid, 76-1320
toxicity
Humidity, 76-1461
Toxicity/experimental animals
Mouse, 76-1461

Oxycarboxin
see also Fungicides
Cytological effects
Plants, 76-1212

Oxythioquinox
see also Fungicides
Spectrometry
Fluorometry, 76-1063

Paraoxon
see also Organophosphates
Behavior
Animals/experimental, 76-1263
Enzyme activity
ATPase, 76-1483
Cholinesterase, 76-0937, 76-0980 76-1197, 76-1260, 76-1263
Microsomes
In vitro, 76-1483
Nervous system
In vitro, 76-1260
Peripheral nerves
Animals/experimental, 76-0980
Placental transfer
In vitro, 76-1197

Paraquat
see also Herbicides
Chromatography
Gas-liquid, 76-1052
Cytological effects
Animals/experimental, 76-1458
Digestive system
Human, 76-1427, 76-1433
Distribution/storage
Human, 76-0904
In vitro, 76-1480
Enzyme activity
Glutathione reductase, 76-0972
Superoxide dismutase, 76-0972
Excretory system
Human, 76-1433
Factors influencing metabolism/ toxicity
Interactions, 76-0972
Hearing
Animals/experimental, 76-1557
Lipids/steroids/sterols
In vitro, 76-1194
Lung
Animals/experimental, 76-0972 76-0976, 76-1458
Human, 76-1163, 76-1420 76-1433
Morbidity and mortality statistics
United Kingdom, 76-1170 76-1171
Porphyrins
In vitro, 76-1194
Residue removal
Water, 76-1118
Respiratory system
Human, 76-1427
Toxicity/humans
General, 76-1427, 76-1428 76-1433
Intentional, 76-0904, 76-1420
Treatment of poisoning
General, 76-1163, 76-1164
Dialysis, 76-0904
Oxygen, 76-1420

Parathion
see also Organophosphates
Biotransformation
Crustacea, 76-1507
In vitro, 76-1507
Microorganisms, 76-0925, 76-1156
Mouse, 76-1507
Plankton/algae, 76-1156
Rat, 76-1196
Chromatography
Gas-liquid, 76-1051, 76-1062
Digestive system
Animals/experimental, 76-1502
Enzyme activity
General, 76-1502
Aliesterase, 76-1223
ATPase, 76-1483
Cholinesterase, 76-1222, 76-1223 76-1460, 76-1512
Mixed function oxidases, 76-1196
Factors influencing metabolism/ toxicity
Adaptation, 76-1222, 76-1223
Interactions, 76-1043
Taxon, 76-1507
Microsomes
In vitro, 76-1483
Residue degradation
Water, 76-1156
Residue removal
Water, 76-1118
Residues/food and feed
Cereals, 76-1119
Fruits, 76-1119
Toxicity/experimental animals
Bee, 76-1043
Insects, 76-1222
Treatment of poisoning
Atropine, 76-1233
Oximes, 76-1233

Patoran 50 WP
see Metobromuron

PCNB
see also Fungicides
Placental transfer
Animals/experimental, 76-1230
Residue degradation
Soil, 76-1144

PCP
see also Herbicides
Absorption
Fish, 76-1279
Biotransformation
Fish, 76-1280
Distribution/storage
Fish, 76-1280
Rat, 76-1205

PCP (cont'd)
Excretion
Fish, 76-1005, 76-1279
Experimental design
Toxicology and pharmacology 76-1206
Factors influencing metabolism/toxicity
Interactions, 76-0947
Taxon, 76-1259
Mutagenesis/teratogenesis
Animals/experimental, 76-0946
Placental transfer
Animals/experimental, 76-0946
Residues/soil
Adsorption, 76-0878
Residues/water
Rivers/streams, 76-1155
Toxicity/experimental animals
Fish, 76-1258, 76-1259
Toxicity/humans
Occupational, 76-0947

Permethrin
see also Pyrethrins
Biotransformation
Rat, 76-1240

Phamphos
see Famphur

Phenamiphos
see also Nematocides
Biotransformation
Plants, 76-1289
Residues/food and feed
Fruits, 76-1289

Phenproxide
Chromatography
Gas-liquid, 76-1335

Phenthoate
see also Organophosphates
Enzyme activity
Cholinesterase, 76-1524
Residue degradation
Food and feed, 76-1385
Residues/food and feed
Cereals, 76-1385

Phorate
see also Organophosphates
Biotransformation
Plants, 76-1243
Factors influencing metabolism/toxicity
Interactions, 76-1243
Residues/food and feed
Vegetables, 76-1387
Respiration, cellular
Microorganisms, 76-1528
Toxicity/humans
Accidental, 76-0905
Toxicity/non-target organisms
Cow, 76-0905
Treatment of poisoning
Atropine, 76-0905

Phosmet
see also Organophosphates
Liver
Animals/experimental, 76-1210
Respiratory system
Animals/experimental, 76-1210

Phosphamidon
see also Organophosphates
Enzyme activity
Cholinesterase, 76-1512
Toxicity/experimental animals
Goat, 76-1193
Treatment of poisoning
Atropine, 76-1550
Oximes, 76-1550

Phosphine
see also Fumigants
Residue dynamics, 76-1381
Residues/food and feed
Cereals, 76-1381, 76-1389 76-1390
Respiration, cellular
In vitro, 76-1015

Phoxim
see also Organophosphates
Residue degradation
Food and feed, 76-1121
Toxicity/experimental animals
Rat, 76-1543

Phthalide
see also Fungicides
Blood/body fluids
Animals/experimental, 76-1278
Enzyme activity
General, 76-1278
Liver
Animals/experimental, 76-1278

Picloram
see also Herbicides
Biotransformation
Plants, 76-1283
Chromatography
Thin-layer, 76-1330
Titration, 76-1340
Toxicity/humans
Accidental, 76-1002
Toxicity/non-target organisms
General, 76-1002

***O*-Pinacolyl methanephosphonyl fluoride**
see Soman

Piperonyl butoxide
see also Synergists
Biotransformation
Insects, 76-1248
Distribution/storage
Insects, 76-1248
Factors influencing metabolism/toxicity
Adaptation, 76-1220
Interactions, 76-1248, 76-1518
Microsomes
Animals/experimental, 76-1220
In vitro, 76-1219

Piperonyl butoxide (cont'd)
Mutagenesis/teratogenesis
Animals/experimental, 76-1518
Respiration, cellular
Animals/experimental, 76-1220
In vitro, 76-1219

Pirimiphos-ethyl
see also Organophosphates
Residue degradation
Food and feed, 76-1372

Piscicides
see Rotenone; Squoxin

Plantvax
see Oxycarboxin

Plictran
see also Tin compounds
Enzyme activity
Adenylate cyclase, 76-1211
ATPase, 76-1211
Respiration, cellular
Animals/experimental, 76-1211

PMP
see Phosmet

Polychlorinated biphenyls
Analysis
Sample preparation, 76-1064
Bile
Animals/experimental, 76-0965
Chromatography
Gas-liquid, 76-1064
Distribution/storage
Molluscs, 76-1008
Eggshell effects
Animals/experimental, 76-1544
Animals/non-target, 76-0917
Embryo/fetus
Animals/experimental, 76-1017
Environmental pollution, 76-1351
Enzyme activity
GOT, 76-0968
Mixed function oxidases, 76-0968 76-1503
Excretion
Rat, 76-0965
Factors influencing metabolism/toxicity
Interactions, 76-0965, 76-0968 76-1473
Lysosomes
In vitro, 76-1297
Metabolism
Rat, 76-0968
Mutagenesis/teratogenesis
Animals/experimental, 76-1017 76-1503
Photodecomposition, 76-1132
Porphyrins
Animals/experimental, 76-0968 76-0968
Residue degradation
Animals/non-target, 76-1132
Residue dynamics, 76-0894, 76-1115
Residues/food and feed
General, 76-1413

Polychlorinated biphenyls (cont'd)
Residues/humans
General, 76-1362, 76-1404
Adipose, 76-0875
Blood, 76-1388
Residues/non-target organisms
Bat, 76-1110, 76-1134
Birds, 76-0872, 76-0875
Duck, 76-1378
Eagle, 76-1378
Fish, 76-0872, 76-1112, 76-1153
Goose, 76-1378
Molluscs, 76-1112
Seal, 76-0875
Residues/water
General, 76-1359
Rivers/streams, 76-0865
Toxicity/experimental animals
Crustacea, 76-0994
Toxicity/non-target organisms
Birds, 76-0917
Eggs, 76-0917

Polychlorocamphene
see Toxaphene

Polychloropinene
see also Organochlorines
Safety standards
TLV/MAC, 76-1436

Polyoxin A
see also Antibiotics; Fungicides
Factors influencing metabolism/toxicity
Adaptation, 76-1540

Polyoxin B
see also Antibiotics; Fungicides
Factors influencing metabolism/toxicity
Adaptation, 76-1540

Prometryne
see also Herbicides
Gonads
Animals/experimental, 76-1525
Residues/food and feed
Vegetables, 76-1158
Residues/soil
Movement, 76-0877, 76-1158

Propachlor
see also Herbicides
Chromatography
Gas-liquid, 76-1580
Factors influencing metabolism/toxicity
Interactions, 76-1190

Propanil
see also Herbicides
Chromatography
Gas-liquid, 76-1055

Propham
see also Herbicides
Biotransformation
Plants, 76-1012

Propoxur
see also Carbamates
Alimentary tract
Animals/experimental, 76-1487
Biotransformation
Insects, 76-1209
Microorganisms, 76-0943
Enzyme activity
Cholinesterase, 76-1487
Factors influencing metabolism/toxicity
Adaptation, 76-1209
Residues/air
Residential, 76-1113
Toxicity/experimental animals
Insects, 76-1227
Plants, 76-1227

Prothiophos
see also Organophosphates
Toxicity/experimental animals
General, 76-1547

Prynachlor
see also Herbicides
Metabolism
General, 76-1019

Pyramin
see Pyrazon

Pyrazon
see also Herbicides
Embryo/fetus
Animals/experimental, 76-1468
Toxicity/experimental animals
Frog, 76-1468

Pyrethrins
see also Permethrin; Pyrethrum; Resmethrin
Biotransformation
Insects, 76-1474
Mouse, 76-1474
Rat, 76-1474
Factors influencing metabolism/toxicity
Adaptation, 76-1462
pH, 76-1476
Temperature, 76-1462, 76-1476
Nervous system
Animals/experimental, 76-1462
Reviews
Toxicology and pharmacology 76-1462
Toxicity/experimental animals
Fish, 76-1476

Pyrethrum
see also Pyrethrins
Factors influencing metabolism/toxicity
Interactions, 76-0947
Toxicity/humans
Occupational, 76-0947

Quinalphos
see also Organophosphates
Residues/food and feed
Fruits, 76-1142
Vegetables, 76-1142

Rabcide
see Phthalide

Repellents
see Deet

Resmethrin
see also Pyrethrins
Factors influencing metabolism/toxicity
pH, 76-1292
Pregnancy, 76-0998
Temperature, 76-1292
Toxicity/experimental animals
Fish, 76-1292
Rat, 76-0998

Ro-neet
see also Herbicides
Distribution/storage
Rat, 76-0985

Rodenticides
see Diphacinone; Gliftor; Strychnine; Thallium; Thallium sulfate; Warfarin

Rogor
see Dimethoate

Ronnel
see also Organophosphates
Biochemical effects
General, 76-1308
Distribution/storage
Sheep, 76-1555
Enzyme activity
General, 76-1308
Excretion
Cow, 76-1555

Rotenone
see also Piscicides
Amino acids/peptides/proteins
In vitro, 76-0944
Factors influencing metabolism/toxicity
Adaptation, 76-1462
Interactions, 76-0944
Temperature, 76-1462
Growth
Microorganisms, 76-1215
Mitochondria
In vitro, 76-0944
Nervous system
Animals/experimental, 76-1462
Reviews
Toxicology and pharmacology 76-1462
Toxicity/experimental animals
Plankton/algae, 76-1215
Vitamins/coenzymes
In vitro, 76-0944

SAN 9789
see Norflurazon

Sarin
see also Organophosphates
EEG
Human, 76-1166
Factors influencing metabolism/toxicity

Sarin (cont'd)
Interactions, 76-0918
Toxicity/humans
Occupational, 76-1166
Treatment of poisoning
Atropine, 76-0918
Pralidoxime, 76-0918

SBP-1382
see Resmethrin

Sevin
see Carbaryl

Simazine
see also Herbicides
Bioassay, 76-1087
Biotransformation
Fungi, 76-1186
Microorganisms, 76-1186
Embryo/fetus
Animals/experimental, 76-1494
Factors influencing metabolism/toxicity
Interactions, 76-1186
Gonads
In vitro, 76-1494
Growth
Microorganisms, 76-1186
Metabolism
Plants, 76-1044
Residues/food and feed
Fruits, 76-1391
Toxicity/experimental animals
Microorganisms, 76-1463

Sodium chloride
see also Herbicides
Factors influencing metabolism/toxicity
Taxon, 76-1259
Toxicity/experimental animals
Fish, 76-1258, 76-1259

Soil bactericides
see Nitrapyrin

Soman
see also Organophosphates
Cytological effects
Animals/experimental, 76-1457
Factors influencing metabolism/toxicity
Interactions, 76-0948
Kidney
Animals/experimental, 76-1457
Respiratory system
Animals/experimental, 76-0948
Treatment of poisoning
diazepam, 76-0948

Spritzhormit
see 2,4-D

Squaxon
see Squoxin

Squoxin
see also Piscicides
Chromatography
Gas-liquid, 76-1576

Streptomycin
see also Antibiotics
Residues/food and feed
Fruits, 76-1140

Strychnine
see also Rodenticides
Electrolytes
In vitro, 76-1199

Sumioxon
see Fenitroxon

Sumithion
see Fenitrothion

Supona
see Chlorfenvinphos

Supracid 40
see Methidathion

Synergists
see also Piperonyl butoxide
Enzyme activity
Mixed function oxidases, 76-1221
Respiration, cellular
Animals/experimental, 76-1221
Spectrometry
Atomic absorption/emission 76-1053

2,4,5-T
see also Dioxins; Herbicides
Amino acids/peptides/proteins
Animals/experimental, 76-1238
Blood/body fluids
Animals/experimental, 76-1265
Distribution/storage
Rat, 76-0957
Embryo/fetus
Animals/experimental, 76-1494
Excretion
Rat, 76-1519
Factors influencing metabolism/toxicity
Interactions, 76-0957
Gonads
In vitro, 76-1494
Growth
Microorganisms, 76-1215
Heart
Animals/experimental, 76-1265
Kidney
Animals/experimental, 76-0957 76-1519
Liver
Animals/experimental, 76-1238 76-1265
Nucleic acids
Animals/experimental, 76-1238
Prevention
Disposal, 76-1173
Residues/food and feed
Fruits, 76-1135
Thymus
Animals/experimental, 76-1265
Toxicity/experimental animals
Microorganisms, 76-1217
Mouse, 76-1265
Plankton/algae, 76-0997, 76-1215

2,4,5-T (cont'd)
Toxicity/non-target organisms
Plants, 76-1455

TCA
see also Herbicides
Residue degradation
Soil, 76-0876

TCDD
see Dioxins

TDE
see also Organochlorines
Adrenal
Animals/experimental, 76-1022 76-1517
Human, 76-0991
Amino acids/peptides/proteins
Animals/experimental, 76-1022
Chromatography
Gas-liquid, 76-1325, 76-1334
Distribution/storage
Cow, 76-1246
Fish, 76-0942
Molluscs, 76-1008
Residues/non-target organisms
Fish, 76-1112
Molluscs, 76-1112
Residues/plants
Tobacco, 76-0853, 76-1152
Residues/water
Estuaries/marshes, 76-0888
Respiration, cellular
Animals/experimental, 76-1022
Spectrometry
Mass spectrometry, 76-1334
Therapeutic use
General, 76-0991
Cancer, 76-1262, 76-1517
Toxicity/experimental animals
Plankton/algae, 76-0997

Terbutryne
see also Herbicides
Residues/soil
Adsorption, 76-1159

Tetrachlorvinphos
see also Organophosphates
Toxicity/experimental animals
Insects, 76-1227
Plants, 76-1227

Tetradifon
see also Organochlorines
Residue degradation
Soil, 76-1130
Residues/soil
Movement, 76-1130

Tetramethylthiuram disulfide
see Thiram

Tetranactin
see also Antibiotics
Spectrometry
NMR, 76-1323

TH-6040
see Difluron

Thallium
see also Rodenticides
Electrometry
Polarography, 76-1050

Thallium sulfate
see also Rodenticides
Toxicity/experimental animals
Birds, 76-1208

Thiabendazole
see also Fungicides
Chromatography
Gas-liquid, 76-1074
Cytological effects
In vitro, 76-0973
Immunology
In vitro, 76-0973

Thimet
see Phorate

Thio-tepa
see also Chemosterilants
Factors influencing metabolism/toxicity
Age, 76-1515
Sex, 76-1515
Toxicity/experimental animals
Rat, 76-1515

Thiometon
see also Organophosphates
Blood/body fluids
Animals/experimental, 76-1548
Enzyme activity
General, 76-1548
Heart
Animals/experimental, 76-1548

Thiometon derived compound
Vision
Animals/experimental, 76-1273

Thionazin
see also Organophosphates
Residues/food and feed
Vegetables, 76-1387

Thiophanate-methyl
see also Fungicides
Spectrometry
UV, 76-1579

Thiram
see also Fungicides
Fertility/sterility
Animals/experimental, 76-1035
Growth
Animals/experimental, 76-1035
Pancreas (exocrine)
Animals/experimental, 76-1516

Tin compounds
see Plictran

Toxaphene
see also Organochlorines
Biotransformation
Microorganisms, 76-1027
Enzyme activity

Toxaphene (cont'd)
Cholinesterase, 76-1484
glucose-6-phosphate dehydrogenase, 76-0987
Factors influencing metabolism/toxicity
Humidity, 76-1461
Metabolism
In vitro, 76-1241
Plasma/serum
Animals/experimental, 76-1484
Residues/air
Rural, 76-1375
Residues/non-target organisms
General, 76-0892
Crustacea, 76-0893
Fish, 76-0893
Molluscs, 76-0893
Residues/plants
Tobacco, 76-0853
Residues/water
Estuaries/marshes, 76-0892 76-0893
Wastewater, 76-0893
Safety standards
TLV/MAC, 76-1436
Toxicity/experimental animals
Crustacea, 76-1001
Fish, 76-1001
Molluscs, 76-1040
Mouse, 76-1461

Triarimol
see also Fungicides
Growth
Microorganisms, 76-1007
Toxicity/experimental animals
Microorganisms, 76-1007

Tribunil
see Methabenzthiazuron

Trichlorfon
see also Organophosphates
Amino acids/peptides/proteins
Animals/experimental, 76-1485
Digestive system
Animals/experimental, 76-1304
Enzyme activity
Cholinesterase, 76-1535
Lipase, 76-1304
Immunology
Animals/experimental, 76-1042
Residue dynamics, 76-1380
Residues/non-target organisms
Plants, 76-1380
Reviews
Analysis, 76-1570
Toxicity/experimental animals
Mouse, 76-0928
Toxicity/humans
Accidental, 76-1298

Trichloroethylene
see also Fumigants
Enzyme activity
GOT, 76-0968
Mixed function oxidases, 76-0968
Factors influencing metabolism/toxicity
Interactions, 76-0968
Metabolism
Rat, 76-0968
Porphyrins
Animals/experimental, 76-0968

Trichloropropionitrile
Gonads
Animals/experimental, 76-1525

Trifenmorph
see also Molluscicides
Spectrometry
Colorimetry, 76-1338

Trifluralin
see also Fluorine compounds; Herbicides
Amino acids/peptides/proteins
Microorganisms, 76-0935
Biotransformation
Microorganisms, 76-0897
Factors influencing metabolism/toxicity
Interactions, 76-1190
Mitosis/meiosis
Microorganisms, 76-0935
Residue degradation
Soil, 76-0897, 76-0899
Residues/soil
Volatilization, 76-1126
Toxicity/experimental animals
Microorganisms, 76-1303

Triforine
see Fungicides

Trolene
see Ronnel

Tukithion
see Prothiophos

Uzgen
see Benomyl

Vitavax
see Carboxin

Warfarin
see also Rodenticides
Amino acids/peptides/proteins
In vitro, 76-1459
Experimental design
Toxicology and pharmacology 76-1459
Metabolism
Rat, 76-0936
Plasma/serum
Animals/experimental, 76-1261
In vitro, 76-1459
Vitamins/coenzymes
Animals/experimental, 76-1261

3,5-Xylenyl *N*-methylcarbamate
see Maqbarl

Zineb
see also Carbamates; Fungicides
Enzyme activity
Mixed function oxidases, 76-1469
Immunology
Animals/experimental, 76-1042
Residues/plants
Tobacco, 76-1341

Ziram
see also Carbamates; Fungicides
Immunology
Animals/experimental, 76-1042

Author Index

Abbasi, A. H., 76-1136
Abbasov, T. G., 76-1329
Abbott, U. K., 76-1499, 76-1500
Abdel-Ghafar, S., 76-1122
Abdel-Hafez, A. M., 76-1224, 76-1225
Abdulla, M., 76-0850
Abdullaev, Sh., 76-1405
Abe, E., 76-1275, 76-1277, 76-1278 76-1451
Abe,K., 76-1305
Abe, S., 76-1388
Abou Akkada, A. R., 76-1189
Abou-Donia, M. B., 76-1122
Abraham, K. O., 76-1317
Abueva, A. A., 76-1509
Adachi, I., 76-1305
Adams, D. F., 76-1128
Adams, P. C., 76-0892
Adamus, J., 76-1326
Addison, J. B., 76-0861
Adelman, I. R., 76-1258, 76-1259
Adler, M., 76-1423
Ahlrichs, J. L., 76-1162
Ahmed, F. E. M. M., 76-1216
Akitake, H., 76-1279, 76-1280
Alam, M. T., 76-1501
Albertini, L., 76-1498
Albrecht, R., 76-1469
Alderweireldt, F., 76-1577
Alekseeva, N. P., 76-1562
Alexander, J. L., 76-1311
Alford, A. L., 76-1334
Ali, K. A., 76-1138, 76-1331
Ali, K. M., 76-1193
Allen, J. R., 76-1521
Allison, A. C., 76-1071
Alth, G., 76-1323
Altmann, H. J., 76-1192
Amiel, J. L., 76-1299
Anand, R., 76-1566
Andersen, D. R., 76-1410
Anderson, D. W., 76-1544
Anderson, J. P. E., 76-1127, 76-1475
Anderson, P. W., 76-0879
Ando, K., 76-1323
Ando, M., 76-0920, 76-1536, 76-1558
Andreoli, V., 76-1468
Andropova, S.N., 76-1515
Andryushchenko, V. V., 76-1523
Aoki, N., 76-1388
Aomine, S., 76-0878
Appleby, A. P., 76-1159
Arcamone, F., 76-1041
Ariaratnam, V., 76-1209
Arimatsu, Y., 76-1450
Armstrong, D. A., 76-1269
Armstrong, J. F., 76-0909
Arora, S. K., 76-1262
Arthur, R. D., 76-1375
Asaka, S., 76-1335
Asakawa, M., 76-0851
Asanuma, N., 76-1143
Augustinsson, K. B., 76-1481
Aust, S. D., 76-1194
Avancini, D., 76-1394
Axelson, O., 76-1185
Axenfors, B., 76-1481
Ayala, J., 76-1180
Babakhanyan, R. V., 76-1198
Babiy, L. I., 76-1308
Bagaev, V. B., 76-1509
Bagge, P., 76-0872
Bago-Szmodits, G., 76-1589
Bailie, M. D., 76-1519
Bains, G. S., 76-1145
Baker, H. J., 76-1187
Baker, R. C., 76-1219, 76-1220
Balanescu, A., 76-1182
Balinova, A., 76-1391, 76-1392
Ballantyne, B., 76-1434
Balter, S. A., 76-1317
Banares-Munoz, M. A., 76-1366
Bannister, T. M., 76-0923
Baranovsky, G. I., 76-1319
Barduta, Z., 76-1119
Bargellini, A., 76-1318
Baron, A., 76-1299
Barrentine, B. F., 76-1375
Barrow, W. W., 76-1306
Bascol-Liversac, J., 76-1427
Bates, R. B., 76-1262
Bauer, U., 76-1118
Baweja, A. S., 76-1133
Bazzi, B., 76-1385
Bean, J. R., 76-1208
Bechade, A., 76-1374
Behari, J. R., 76-1229
Behera, J., 76-1213
Beier, D., 76-1535
Belov, V. N., 76-0896
Benezet, H. J., 76-1537
Benson, W. W., 76-1576
Berencsi, G., 76-1553
Berg, O., 76-0875
Bergevin, P. R., 76-1032
Berkheiser, V. E., 76-1162
Bernadou, J., 76-1512, 76-1534
Bertagnolli, B. L., 76-1256
Bertino, J. R., 76-1033
Bescol-Liversac, J., 76-1433
Best, J. A., 76-1158
Betker, W. R., 76-1585
Beynon, K. I., 76-1338
Bhalla, J. S., 76-1397
Bhunya, S. P., 76-1213
Bielorai, H., 76-1130
Binder, N., 76-1483
Binnie, G. A. C., 76-1170
Bjerk, J. E., 76-1413
Black, W. M., 76-1281
Blumenschein, G. R., 76-1306
Bock, W. J., 76-1301
Bockhorn, J., 76-1301
Boehme, C., 76-1192
Boelcke, G., 76-1444
Bolay, A., 76-1151
Bollag, J. M., 76-1255
Bolotnyy, A. V., 76-1524
Bolt, H. M., 76-1034
Bolton, H. T., 76-1402
Bonadonna, G., 76-1313
Bonzano, A., 76-0860
Borselli, L., 76-1414
Boulekbache, H., 76-1492
Bourke, J. B., 76-1401
Bovey, P., 76-1347
Bowden, J. A., 76-1237
Boyadjiev, S., 76-1233
Braidech, T. E., 76-1154
Braidwood, A. S., 76-1289
Brambilla, C., 76-1313
Brankov, K., 76-0918
Brindley, W. A., 76-1227
Brodtmann, N. V., Jr., 76-1111
Brown, A. W. A., 76-1344
Brown, M. J., 76-1379, 76-1490
Brown, W. S., 76-1102
Bruns, V. F., 76-1161
Bruntsch, U., 76-1310
Brusco, A., 76-1395
Brzin, M., 76-1310
Buchenauer, H., 76-1149
Bulkina, V. A., 76-1430
Bull, U., 76-1315
Bullard, R. W., 76-1239
Bulteau, V., 76-1441
Burchenal, J. H., 76-1035
Burchfiel, J. L., 76-1166
Bus, J. S., 76-1194
Bushe, K. A., 76-1301
Businelli, M., 76-1147
Butrico, F. A., 76-1346
Cahalan, M. D., 76-1199
Cain, J. D., 76-1375
Caissie, G. E., 76-1324
Calmon, J. P., 76-1124, 76-1125
Calvet, R., 76-1382
Campbell, C. J., 76-1190
Camper, N. D., 76-1556
Canale, G., 76-1385
Canel, F., 76-1587
Canellos, G. P., 76-1040
Cangir, A., 76-1302
Cardenas, J. O., 76-1306
Cardona, R., 76-1519
Caro, J. H., 76-1370
Carpene, E., 76-1395
Carr, R. E., 76-1327
Carsiotis, M., 76-1249
Carter, G. E., 76-0897
Carter, L. J., 76-1105
Casalis, J., 76-1363, 76-1367, 76-1406
Casarett, L. J., 76-1205, 76-1206
Casida, J. E., 76-1240, 76-1241 76-1474, 76-1482
Cassell, G. H., 76-1187
Cestero, R. V., 76-1136
Chaklos, R. J., 76-0923

Chasseaud, L. F., 76-1510
Chau, A. S. Y., 76-1315
Chaumont, P., 76-1587
Chebotko, K. A., 76-1565
Chem, J. Y. T., 76-1478
Chemtai, A. K., 76-1461
Cheng, H. H., 76-1322, 76-1340
Cherepanov, F. S., 76-1319
Chernyshova, R.A., 76-1562
Cherry, J. H., 76-1238
Chhina, S., 76-1264
Ching, S., 76-1206
Ching, S. A., 76-1205
Choi, J., 76-0878
Chopin, S. F., 76-1466
Chopra, S. L., 76-1133
Chou, S., 76-1580
Cichy, A., 76-1307
Clapp, D. W., 76-0900
Clark, D. E., 76-1188
Clark, D. R., Jr., 76-1110, 76-1134
Clarkson, T. W., 76-1136
Clausen, J., 76-0875
Clausen, J. F., 76-0910
Cleare, M. J., 76-1037
Closset, J. L., 76-1577
Coburn, J. A., 76-1315
Cochrane, W. P., 76-1318
Colbert, F. O., 76-1159
Colburn, J. F., 76-1290
Colliot, F., 76-1508
Comes, R. D., 76-1161
Conde, J., 76-1442
Conner, W. L., 76-1296
Connors, T. A., 76-1038
Conran, P. B., 76-1039
Copin, A., 76-1577
Coppage, D. L., 76-1154
Cordoba Palacio, D., 76-1417
Cordor, M. P., 76-1308
Cortez Pimental, J., 76-1435
Costantini, F., 76-1468
Cotillo, P., 76-1487
Coulston, F., 76-1231
Cox, D. C., 76-0863
Craig, L. F., 76-1120
Cripe, C. R., 76-1418
Crisetig, G., 76-1395
Crist, H. L., 76-1325
Croft, B. A., 76-1344
Crome, P., 76-1164
Crosby, D. G., 76-0916, 76-1319
Cross, A. J., 76-1282
Crossland, B., 76-0848
Cubit, D. A., 76-1108
Cummings, F. H., 76-0845
Cunningham, T., 76-1312
Czarnik, W., 76-1372
D'Alessandro De Luca, E., 76-1415
76-1416
Dabrowski, J., 76-1372
Damico, J. N., 76-1478
Danilov, A. E., 76-1202
Dannals, L. E., 76-0852
Dao, T., 76-1312
Dappen, G., 76-0889
Datta, K. K., 76-1229
Daughton, C. G., 76-1319
David, D., 76-1493, 76-1497
Davis, A. C., 76-1401
Davis, R., 76-1303
De Battistis, P., 76-1360
de la Fuenta, J. M., 76-1581
De Wolf, L., 76-1168
Debackere, M., 76-1139
Deichmann, W. B., 76-1108
DeJager, R., 76-1309
Dencker, I., 76-0850
Deshmukh, S. N., 76-1396, 76-1397
Deshpande, W. M., 76-1353
Desi, I., 76-1471
Desoille, H., 76-1518
Dettbarn, W. D., 76-1483
DeVita, V. T., Jr., 76-1040
Dhaliwal, G. S., 76-1381
di Marco, A., 76-1041
Diamant-Gerger, O., 76-1427
Didier, R., 76-1494
Dietrick, E. J., 76-1104
Dikshith, T. S. S., 76-1229
Dikstein, S., 76-1423
Dimitrescu, E., 76-1298
Dimitrova, N., 76-1167
Dishburger, H. J., 76-1120
Djoumbi-Sango, E., 76-1439
Dollar, A. M., 76-0863
Domanski, J. J., 76-0853
Domeracki, S., 76-1393
Domsch, K. H., 76-1475
Doneche, B., 76-1383
Dorn, P., 76-1371
Dorough, H. W., 76-1152, 76-1244
Dorshun, M. N., 76-1454
Douze, J. M. C., 76-0904
Dowlen, H. H., 76-1250
Dremova, V. P., 76-1563
Dreze, Ph., 76-1577
Drost, R. H., 76-0904
Drummond, R. O., 76-1252
Duffy, F. H., 76-1166
Duke, T. W., 76-1095
Dumitrescu, H., 76-1119
Dunlap, K. L., 76-1311
Dunn, C. L., 76-0874
Duprat, P., 76-1531
Dupuis, D., 76-1469
Dura, G., 76-1471
Durant, C. J., 76-0892
Durant, F., 76-1577
Durham, W. F., 76-0909
Duseja, D. R., 76-0885
Dusold, L. R., 76-1478
Dutripon, E., 76-1582
Dye, M. H., 76-1140
Dyson, D. P., 76-1291
Dzilinski, E., 76-1407, 76-1408
E. G. Feldmann, 76-1093
Eben-Moussi, E., 76-1439
Eberle, D. O., 76-1568
Ebing, W., 76-1345
Ecobichon, D. J., 76-1232
Edelstyn, G. A., 76-1311
Eder, G., 76-1112
Edwards, C. A., 76-0868
76-1305
Efimov, N. P., 76-1342
Eglinton, G., 76-1567
Eidt, D. C., 76-0854
Eiker, W. M., 76-0899
El-Essawi, T., 76-1122
El Zorgani, G. A., 76-1146
Elliott, M., 76-1240
Elmamlouk, T. H., 76-1507
Eminovici, A., 76-1309
Entzian, W., 76-1301
Epker, B. N., 76-1290
Erman, M. I., 76-0907
Ernst, S. E., 76-1252
Ernst, U., 76-0845
Ernst, W., 76-1112
Essig, H. W., 76-1246
Etsuchu, T., 76-1547
Etter, G. E., 76-1551
Evans, J. O., 76-0885
Evans, R. T., 76-1585
Evrard, G., 76-1577
Fairshter, R. D., 76-1163
Fallin, E., 76-1207
Fang, S. C., 76-1207
Farmer, J. H., 76-0928, 76-0928
Farrow, F. O., 76-1340
Farwell, S. O., 76-1128
Fayein, E., 76-1531
Feder, G., 76-1092
Fernandez Garcia, I., 76-1358
Finlayson, D. G., 76-1190
Fischer, G. W., 76-1541, 76-1542
Flannery, E. P., 76-1308
Fletcher, K., 76-1171
FLint, D. R., 76-1289
Flores Flores, R., 76-1387
Flori, P., 76-1400
Focht, D. D., 76-1254
Forester, J., 76-1266
Forster, M. S., 76-1195
Foumbi, J., 76-1439
Fountaine, J. E., 76-1155
Fournier, E., 76-1428, 76-1496, 76-1533
76-1534
Fox, J. E., 76-1291
Frank, C. W., 76-1312
Frank, R., 76-1153
Freeman, H. P., 76-1370
Freeman, R. B., 76-1136
Freireich, E. J., 76-1306
Fretz, T. A., 76-1234
Freyberg, G., 76-1390
Fries, G. F., 76-1251
Fuchs, A., 76-1477
Fuehr, F., 76-1322
Fuentes Del Valle, O., 76-1387
Fuhremann, T. W., 76-1243
Fujiwara, K., 76-1388
Fukuhara, T., 76-1169
Fukuyama, T., 76-1446
Furczak, J., 76-1288
Gabica, J., 76-1576
Gaddy, R. G., 76-1473

Gaines, T. B., 76-1265
Galasinska-Pomykol, I., 76-1549
Gallmeier, W. M., 76-1310
Garces Bruses, J., 76-1440
Garcia Rico, A. M., 76-1440
Garnas, R. L., 76-1319
Garrison, A. W., 76-1591
Gaughan, L. C., 76-1240, 76-1474
Gauntley, P., 76-1587
Geier, P. W., 76-0840, 76-0840
Gejewski, D., 76-1550
Genkina, G. L., 76-1405
Gentile, I. A., 76-0860
George, F., 76-1303
Georghiou, G. P., 76-1209
Gerber, H. R., 76-1568
Gertig, H., 76-1287
Gervais, P., 76-1427
Gibson, J. E., 76-1194
Giermaziak, H., 76-1548
Giessner, T., 76-1507
Gil'man, Ts.I., 76-1454
Gillespie, P. J., 76-1311
Gillett, J. W., 76-0891
Girard-Wallon, C., 76-1518
Giuran, V., 76-1513
Gladenko, I. N., 76-1308
Gladney, W. J., 76-1252
Glass, W. I., 76-1174
Glazer, E., 76-1465
Gleyberman, S. E., 76-1563
Glogowski, K., 76-1373
Gnaegl, F., 76-1151
Gnusowski, B., 76-1393
Goerke, H., 76-1112
Goldfrank, L., 76-1453
Goldin, A., 76-1045
Goncharuk, E. I., 76-0858
Gonczi, L., 76-1471
Gonzalez-Gomez, C., 76-1364, 76-1365
Gore, M. G., 76-1566
Gorlova, O. E., 76-1562
Gostkowska, K., 76-1288
Goto, S., 76-1355
Gottlieb, J. A., 76-1306
Goulding, R., 76-1164
Goursaud, J., 76-1363, 76-1367
76-1406
Gradiski, D., 76-1531
Grady, G. D., 76-1324
Graham, O. H., 76-1252
Grant, D. L., 76-1228
Grasso, C., 76-1414
Greenhalgh, R., 76-1232, 76-1318
76-1321
Groch, L., 76-1210
Grossmann, G., 76-1458
Grote, W., 76-1301
Grover, R., 76-1160
Grubic, Z., 76-1310
Gruebner, P., 76-1569
Grunow, W., 76-1192
Guardia, T., 76-1460
Guenard, J., 76-0927
Guillam, C., 76-1427, 76-1433
Guirguis, G. N., 76-1227
Gulic, F., 76-1420
Gulyamov, T., 76-1516
Gupta, D. S., 76-1398, 76-1399
Gurova, A. I., 76-1562
Gutin, P. H., 76-1043
Gutterman, J. U., 76-1306
Guyon, F., 76-1427
Guzman, J. A., 76-1460
Haderlie, E. E., 76-0888
Hadzovic, S., 76-0918
Hagiwara, A., 76-1143, 76-1178
Haglund, G., 76-0850
Haire, P. L., 76-0853
Haley, T. J., 76-0928
Hall, F. R., 76-1100
Hallmen, U., 76-1283
Hamed, A. S., 76-1224, 76-1225
Hamm, K., 76-1467
Hammond, C. L., 76-1402
Hamza, S. M., 76-1165
Haneda, M., 76-1323
Hansen, D. J., 76-1266
Hansen, L. G., 76-1505
Harder, H. C., 76-1044
Harouchi, A., 76-1517
Harris, W. F., 76-1096
Hasegawa, J., 76-1579
Hassan, M. A., 76-1189
Hattula, M. L., 76-1378
Hayashi, K., 76-1273
Hayashi, T., 76-1179, 76-1277, 76-1323
Hayes, W. J., Jr., 76-1419
Hebert, S., 76-1496
Heenan, M. P., 76-1142
Heinrichs, W. L., 76-1195
Helling, C. S., 76-1131
Hendrickson, C. M., 76-1237
Hendrickson, H.R., 76-1530
Henniger, G. R., 76-1473
Henninger, N. M., 76-1255
Herbst, K. D., 76-1308
Herbst, M., 76-0927
Herlihy, M., 76-0856
Hettwer, H., 76-1457
Heyndrickx, A., 76-1168
Hickisch, B., 76-1463
Highman, B., 76-1265
Hikosaka, Y., 76-1271
Hilbig, D., 76-1386
Hill, J., IV, 76-0891
Hills, J. P., 76-1426
Himberg, J. J., 76-1459
Hirakawa, H., 76-1305
Hoben, H. J., 76-1205, 76-1206
Hodgson, E., 76-1219, 76-1220, 76-1221
Hodgson, G. W., 76-1584
Hoermann, W. D., 76-1586
Hohler, K., 76-1321
Hojs, M., 76-1420
Holguin, G., 76-1239
Hollmann, H., 76-1444
Holmstead, R. L., 76-1241
Holmstedt, B., 76-1438
Holt, R. F., 76-1320
Holt, T. M., 76-1466
Hook, J. B., 76-1519
Hori, M., 76-1540
Horiguchi, Y., 76-1275, 76-1276
Horton, J., 76-1312
Horvath, A. L., 76-0855
Hosokawa, S., 76-1538
Hosotsuji, T., 76-1559
Howells, L. C., 76-1282
Hsieh, D. P. H., 76-0925
76-1319
Hsu, J. M. C., 76-1218
Huaman, B., 76-1487
Hudson, R. H., 76-1208
Huff, J. E., 76-1090
Huguenin, P., 76-1299
Hurst, H. E., 76-1244
Huston, C. K., 76-1530
Iatropoulos, M. J., 76-1231
Idanpaan-Heikkil, J., 76-1135
Ide, H., 76-1143, 76-1178, 76-1178
76-1274, 76-1276
Igarashi, H., 76-1144
Imai, M., 76-1552
Inada, S., 76-1335
Inoue, Y., 76-1388
Irwin, L., 76-1303
Ishikawa, K., 76-1403
Ishikawa, S., 76-1429, 76-1522
Ivanov, Y. J., 76-1202
Ivemark, B., 76-1458
Ivey, M. C., 76-1583
Ivie, G. W., 76-1299
Izmailova, G. E., 76-1317
Jalali, I., 76-1127
Jalil, R., 76-1226
Janes, N. F., 76-1240, 76-1282
Jao, L. T., 76-1474
Jaroszewicz, K., 76-0919
Jaruzelski, M., 76-1393
Jarvinen, A. W., 76-0891
Javaid, M. Y., 76-1226
Jeanne-Levain, N., 76-1495
Jentzsch. R., 76-1541, 76-1542
Jimenez Lopez, A., 76-1366
Johnson, J. H., 76-1188
Johnson, J. M., 76-0863
Johnson, M. K., 76-1191
Johnson, R. J., 76-0910
Johnson, R. K., 76-1045
Johnson, W., 76-1432
Jones, R. F., 76-1249
Jones, R. J., 76-1306
Jonsson, H. T., Jr., 76-1473
Joseph, H., 76-1254
Joshipura, P. B., 76-1155
Julkunen, R. J. K., 76-1459
Junge, C. E., 76-0869
Jurga, L., 76-1307
Justice, G. R., 76-1308
Kacew, S., 76-1211
Kadota, T., 76-1200, 76-1201
Kadyan, A. S., 76-1399
Kadyrov, U. Z., 76-1516
Kaimal, P. M., 76-1588
Kaiser, G., 76-1293
Kakiki, K., 76-1540
Kaku, S., 76-1369

Kalac, J., 76-1502
Kanazawa, J., 76-1267
Kanda, M., 76-1177
Kaplan, K. M., 76-0923
Kapoor, I. P., 76-1472, 76-1505
Kapoor, T. R., 76-1398
Karimov, V. A., 76-1445
Karlog, O., 76-1362
Kasatiya, S. S., 76-1501
Kashi, K. P., 76-1337
Kasowski, M. A., 76-1350
Kasowski, W. J., 76-1350
Katsumata, C., 76-1143
Katzenelson, M., 76-0903
Kaufman, R., 76-1309
Kaushik, S. N., 76-1399
Kavetskii, V. N., 76-1565
Kawai, M., 76-1486
Kawamura, T., 76-1412
Kawanishi, A., 76-1143
Kay, K., 76-1504
Kazano, H., 76-0851
Kazanovskiy, E. S., 76-1307, 76-1328
Kearney, P. C., 76-1126
Keil, J. E., 76-1473
Keith, L. H., 76-1591
Kekki, M., 76-1459
Keliher, P. N., 76-1155
Keller, J., 76-1311
Kelley, A. D., 76-1161
Kelso, J. R. M., 76-1153
Kenda, R., 76-1318
Kendall, M. W., 76-1514
Kennedy, M. W., 76-1488
Kerkut, G. A., 76-1566
Keszthelyi, B., 76-1564
Kevan, P. G., 76-0843
Khalifa, S., 76-1241
Khan, M. A., 76-1132
Khandelwal, K. C., 76-1528
Kharbanda, P. D., 76-1284
Khera, K. S., 76-1230, 76-1520
Khokhol'kova, G.A., 76-0907
Khovaeva, L. A., 76-1526
Kikawa, H., 76-1412
King, R. R., 76-1321
Kinter, W. B., 76-1272
Kipfer, R. K., 76-1261
Kiritani, S., 76-1356
Kirkpatrick, B. L., 76-1284
Kirstein, R., 76-1453
Kishk, F. M., 76-1122
Kister, S. J., 76-1325
Klein, W., 76-1384
Kliger, L., 76-1130
Klisenko, M. A., 76-1327
Klvana, M., 76-1307
Kneffel, Z., 76-1471
Knoppler, H. O., 76-1371
Knowles, C. O., 76-1248
Knox, D. A., 76-0922
Knudson, A. G., 76-1302
Knusli, E., 76-0849
Knysh, I. T., 76-1292
Kobayashi, K., 76-1279, 76-1280
Kobayashi, N., 76-1547
Koch, R., 76-1359
Koch, R. B., 76-1211
Kocmierska-Grodzka, D., 76-1304
Koeing, C. C., 76-1418
Koellmer, H., 76-0927
Kohda, H., 76-1200
Koivusaari, J., 76-1378
Kono, S., 76-1109
Konstantinov, K. A., 76-1392
Kontson, A., 76-1126
Konyukhov, A. F., 76-1343
Korchagin, V. N., 76-1094
Korf, N. M., 76-1317
Korolev, V. I., 76-1292
Korotkova, O. A., 76-1268
Korte, F., 76-1231, 76-1295, 76-1384
Kosmatyi, E. S., 76-1565
Koss, G., 76-1377
Kostyniak, P. J., 76-1136
Kovacevic, N., 76-1506
Kovalenko, L. I., 76-1430
Krakoff, I. H., 76-1309
Kraul, I., 76-1362
Krause, W., 76-1467
Krauthacker, B., 76-1570
Kreczko, S., 76-0919
Kremer, W. B., 76-1047
Krijgsman, W., 76-1326
Krishnamoorthy, K. K., 76-1138
Kucharczyk, N., 76-0852
Kuchinskiy, A. L., 76-0896
Kuhar, M. J., 76-1260
Kuhr, R. J., 76-1401
Kulharni, A. P., 76-1219
Kulkarni, A. P., 76-1220
Kumar, S., 76-1332
Kumoaka, S., 76-1305
Kundiev, Yu. I., 76-0907
Kurosawa, K., 76-1275, 76-1277 76-1278, 76-1451
Kutsenok, B. I., 76-1454
Kuwahara, Y., 76-1369
Kuwatsuka, S., 76-1403, 76-1561
Kveseth, N. J., 76-1413
LaFleur, K. S., 76-0877
Lal, R., 76-1381
Lallukka, R., 76-1135
Lamdin, J. M., 76-1402
Lamont, T. G., 76-1110
Lanciotti, E., 76-1414
Landon, E. J., 76-1483
Landreth, R. E., 76-1173
Lane, L. G., 76-0902
Laparre, Ch., 76-1299
Lapchenko, V. S., 76-1137
Latif, A., 76-1193
Lavee, S., 76-1245
Lavy, T. L., 76-0890
Lawleww, E. W., 76-0846
Lazar, E. C., 76-0908
Lecorsier, A., 76-1533, 76-1534
Lee, W. L., 76-0888
Leinonen, P. J., 76-1115
Leoni, V., 76-1415, 76-1416
Levin, V. A., 76-1048
Levina, V. Ya., 76-1515
Levy, L., 76-1423
Lewis, C., 76-1432
Lewis, D. L., 76-1204
Lewis, M. F., 76-1293
Lichtenstein, E. P., 76-0870, 76-1243
Lin, T., 76-1543
Lincer, J. L., 76-1247
Lindsey, J. R., 76-1187
Lisella, F. S., 76-1432
Liska, D., 76-1422
Litzbarski, B., 76-1484
Litzbarski, H., 76-1484
Liu, L. C., 76-0862
Livingston, R. J., 76-1418
Loadholt, C. B., 76-1473
Locher, G. W., 76-1293
Lock, E. A., 76-1480
Locke, R. K., 76-1478
Loeffler, J. E., 76-1530
Loewus, F. A., 76-1285
Lomax, P., 76-1506
Long, J. E., 76-0842
Lopez-Gonzalez, J. de D., 76-1364 76-1365, 76-1366
Lopez Ibarra, R., 76-1581
Losch, K., 76-1535
Love, J. L., 76-1141
Lucisano, A., 76-1360, 76-1361
Luquet, F. M., 76-1363, 76-1367 76-1406
Lutz, H., 76-1470, 76-1491
Lutz-Ostertag, Y., 76-1470, 76-1497
MacCuaig, R. D., 76-1376
MacDonald, W. E., 76-1108
Machin, A. F., 76-1282
Mackay, D., 76-1115
Maes, R. A. A., 76-0904
Magadur, J. L., 76-1531, 76-1587
Mahmoud, S. A. Z., 76-1224, 76-1225
Mahoney, J. J., Jr., 76-1545
Mailman, R. B., 76-1219, 76-1220
Makhija, S. J., 76-1235
Mallet, V. N., 76-1313, 76-1324
Manchon, P., 76-1469
Mansue, L. J., 76-0879
Manz, D., 76-1377
Marcove, R., 76-1287
Marek, B., 76-1333
Marin, I. M., 76-1294
Markina, V. V., 76-1563
Marking, L. L., 76-1292, 76-1476
Marlar, R. J., 76-1521
Marrow, G. S., 76-1251
Marshall, W. D., 76-1321
Martin, C. O., 76-1134
Martin, G. C., 76-1245
Martin, W. L., 76-1246
Marucchini, C., 76-1147
Maruta, H., 76-1486
Mas Marfany, J., 76-1440
Mason, W. A., 76-1121
Massa, D., 76-1395
Mathe, G., 76-1299
Mathews, C. W., 76-0880, 76-1448
Mathis, H. L., 76-1302

Mathur, A. K., 76-1229
Matsumura, F., 76-1537
Matsushima, S., 76-1176, 76-1177 76-1178, 76-1178, 76-1278, 76-1451
Matsushita, T., 76-1450
Mauck, W. L., 76-1476
Mauro, A., 76-1351
Mayr, G. E., 76-1389
McDougall, A., 76-1289
McGrath, H, J. W., 76-1409
McGuire, J. M., 76-1591
McKeller, R. L., 76-1120
McLean, E. O., 76-0895
Medved, L. I., 76-0871, 76-1294
Meeker, D. L., 76-1575
Mehrotra, K. N., 76-1529
Mehta, K., 76-1264
Meiners, A. F., 76-0846
Mel'nik, M. L., 76-0896
Mellors, A., 76-1297
Meloan, C. E., 76-1121
Mendoza, C., 76-1464
Mendoza, C. E., 76-1481
Merali, Z., 76-1211
Merte, H. J., 76-1456
Mertens, H. W., 76-1293
Metcalf, R. L., 76-1472, 76-1505
Mia, A. S., 76-1193
Miayoukou, J. F., 76-1498
Michel, A., 76-1577
Michelson, M. J., 76-1202
Michener, D. W., 76-0895
Mieth, K., 76-1535
Mihara, K., 76-1538
Mikhaleva, A. L., 76-1515
Miki, S., 76-1388
Milcu, S. M., 76-1049
Milhaud, G., 76-1374
Milias, G. W., 76-1101
Millemann, R. E., 76-1269
Miller, C. W., 76-1113
Miller, D. S., 76-1272
Millin, D. J., 76-0864
Milling, A., 76-1231
Milosevic, M., 76-1263
Min. Agric. For., 76-1183
Minenko, A. K., 76-1303
Miranowski, J. A., 76-0845
Mirtursunova, S., 76-1516
Misato, T., 76-1354, 76-1540
Mishra, M. M., 76-1528
Misumi, J., 76-1450
Miura, T., 76-1291
Miyabe, M., 76-1411
Miyachi, Y., 76-1578
Miyakawa, S., 76-1305
Miyamoto, J., 76-1200, 76-1201 76-1538
Miyata, T., 76-1485, 76-1539
Miyazawa, S., 76-1486
Mod, L., 76-1564
Mohan, S. T., 76-1212
Mollenhauer, H. H., 76-1188
Molodyuk, A. V., 76-1515
Molozhanova, E. G., 76-1436
Monaco, T. J., 76-1158
Moore, E., 76-0913
Moore, E. D., 76-1250
Moore, J. A., 76-1236
Morel, G., 76-1587
Morin, P., 76-1299
Morriss, A. C., 76-0867
Moscioni, A. D., 76-1482
Moseman, R. F., 76-1325
Mossop, D. W., 76-1140
Mouillet, L., 76-1367
Mueller, G., 76-1463
Mueller, W. F., 76-1231
Mukula, J., 76-1135
Mukuno, K., 76-1522
Mullen, J. T., 76-1327
Mulrennan, J. A., Jr., 76-1402
Munnecke, D. M., 76-0925
Muraoka, J. S., 76-0880
Murdoch, W. W., 76-1091
Murphy, M. L., 76-1287
Musser, F. L., III., 76-1443
Muthu, M., 76-1145, 76-1337
Myatt, G. L., 76-1232
Nadakavukaren, M. J., 76-1256
Nafei, H. A., 76-1222
Nafel, H. A., 76-1223
Naga, M., 76-1189
Nahum, A. M., 76-1050
Nair, M. R. G. K., 76-1331
Nair, P. G., 76-1588
Naito, M., 76-1486
Nakajima, S., 76-1429
Nakamura, S., 76-1143
Nakamura, T., 76-1404
Nakamura, Y., 76-1403
Narahashi, T., 76-1462
Nash, L., 76-1520
Nasrat, G., 76-1222, 76-1223
Natarajan, C. P., 76-1317
Nawata, Y., 76-1323
Neal, R. A., 76-1196
Neelakantan, S., 76-1528
Neely, D., 76-1281
Nemoto, T., 76-1312
Nesemann, E., 76-1571
Newman, J. F., 76-1172
Nicol, W. M., 76-0867
Nigg, H. N., 76-1472
Niitsu, H., 76-1276
Nikitin, D. P., 76-0907
Nikolova, G., 76-1391
Nisbet, I. C. T., 76-0894, 76-0917 76-1106, 76-1107
Nishiuchi, Y., 76-1546
Nohynek, G., 76-1231
Nolla Pandes, R., 76-1440
Nomura, S., 76-1450
Norden, A., 76-0850
Norman, B. J., 76-1196
Norton, J. L., 76-0886
Novak, A. F., 76-1132
Nowaczyk, W., 76-1287
Nuuja, I., 76-1378
Nye, D. E., 76-1244
Ochoa, M., 76-1309
Ogris, E., 76-1323
Ojeda, N. S., 76-1460
Okonek, S., 76-1425, 76-1444
Olson, L. E., 76-1476
Olson, R. E., 76-1261
Ono, S., 76-1579
Ortwein, L., 76-1408
Osborn, J. L., 76-1519
Oshiba, H., 76-1143, 76-1178
Oshima, H., 76-1552
Osmun, J. V., 76-0915
Ost, W., 76-1477
Otsuka, J., 76-1273
Ottevanger, C. F., 76-1532
Overcash, R. G., 76-1187
Owen, J. R., 76-1250
Ozawa, H., 76-1429
Paal, T., 76-1589
Page, A. C., 76-1530
Palokangas, R., 76-1378
Panchenko, S. E., 76-0859
Panopio, L., 76-1520
Panopio, L. G., 76-1228
Pant, C. P., 76-1302
Panteleev, R. I., 76-1430
Paquelin, A., 76-1433
Pardini, R. S., 76-1203
Paris, D. F., 76-1204
Parkki, M. G., 76-0921
Parrish, P. R., 76-1266
Parrot, R., 76-1299
Pascovici, V., 76-1298
Patil, K. C., 76-1537
Patrick, J. M., Jr., 76-1266
Patterson, J. W., 76-0847
Paul, B. S., 76-1489
Pauls, C. F., 76-0882
Pavel, A., 76-1182
Pawar, S. S., 76-1235
Pawelski, S., 76-1051
Peakall, D. B., 76-1272
Pease, H. L., 76-1320
Peeper, T. F., 76-0866
Pelissier, M. A., 76-1469
Pellerin, D., 76-1517
Pen'kov, L. A., 76-1303
Pennington, J., 76-1120
Pepin, H. S., 76-1490
Perelygin, V. M., 76-0858
Persson, K., 76-0850
Pesic, V., 76-0918
Pesino, L., 76-1361
Pesson, P., 76-1349
Peterson, J. E., 76-1575
Petrenko, V. A., 76-1319
Petrocelli, S. R., 76-0898
Pfleger, R., 76-1118
Philbert, M., 76-1518
Phillips, D. V., 76-1242
Phillips, J. H., 76-0888
Philpot, R. M., 76-1221
Piedade, M. F., 76-1574
Piedade, R. J., 76-1574
Pieper, G. R., 76-1380
Pik, A. J., 76-1584
Pinault, L., 76-1374
Pisklov, V. P., 76-1341

Pittman, K. A., 76-1488
Pitts, F., 76-1303
Plotnick, H. B., 76-1296
Polikarpov, G. G., 76-1523
Polster, M., 76-1300
Ponti, I., 76-1400
Popa, G., 76-1181
Popovich, N. A., 76-0859
Potter, J. C., 76-1530
Potti, E. E., 76-1588
Pouillart, P., 76-1299
Powell, W. J., 76-1128
Preussmann, R., 76-1527
Proctor, N. H., 76-1482
Przywara, S., 76-1326
Puccetti, G., 76-1415, 76-1416
Puchmuller, A., 76-1460
Pugh, W. S., 76-0905
Puhl, R. J., 76-0852
Pulman, D. A., 76-1240
Pund, W. A., 76-1246
Quan, D. Q., 76-1512, 76-1534
Quick, M. P., 76-1282
Quirke, W., 76-0856
Rabitz, H., 76-1571
Radice, M., 76-1385
Raghavan, B., 76-1317
Raguraj, R., 76-1138
Rajakannu, K., 76-1138
Ramade, F., 76-1348
Ramsteiner, K. A., 76-1586
Ramus, J. S., 76-0912
Rao, R. M., 76-1132
Raslawski, Z., 76-1407
Reagan, M. T., 76-1447
Redfern, R. E., 76-0922
Regev, U., 76-1092
Reichle, D. E., 76-1511
Reimold, R. J., 76-0892, 76-0893
Rice, J. R., 76-1120
Richardson, D. O., 76-1250
Richmond, C. E., 76-1380
Rieger, H., 76-1425
Rip, J. W., 76-1238
Ripault, J., 76-1518
Risebrough, R. W., 76-1544
Roan, C. C., 76-0883, 76-0884
Roberts, D. V., 76-1431
Roberts, H. A., 76-1190
Roberts, J. J., 76-1052
Robertson, B., 76-1458
Robertson, K. J., 76-1117
Robinson, E., 76-1128
Robinson, E. L., 76-1157
Rogers, A., 76-1297
Rogers, C. J., 76-1173
Rogers, H., 76-1282
Rogers, R. W., 76-1246
Roggenkaemper, P., 76-1456
Rogl, F., 76-1420
Romer, F., 76-1301
Romo Garza, C., 76-1387
Romodanov, A. P., 76-1300
Rosca, V., 76-1182
Rose, M. S., 76-1480
Rosenberg, C., 76-1135
Rosic, N., 76-1263, 76-1506
Rosival, L., 76-0873
Rosner, D., 76-1312
Rossi, A., 76-1313
Roux, F., 76-1496
Rozman, K., 76-1231
Rubtsov, I. A., 76-1352
Ruiz de Almodovar Rivera, J. M. 76-1364, 76-1365
Runser, D. J., 76-1312
Rusev, P., 76-1167
Ruzicka, J. H. A., 76-1314
Safe, S., 76-1297
Sagerman, R. H., 76-1288
Saito, T., 76-1485, 76-1539
Sakakibara, J., 76-1578
Salk, M. S., 76-1215
Samosvat, L. S., 76-1330
Sandridge, R. L., 76-1311
Santi, R., 76-1385
Saramma, P. U., 76-1396, 76-1397
Sasaki, K., 76-1275, 76-1276, 76-1277 76-1278, 76-1339, 76-1451
Sato, N., 76-1593
Sato, R., 76-1144
Satsumata, C., 76-1178
Sayag, D. R., 76-1124, 76-1125
Scarponi, L., 76-1147
Schaap, A. L., 76-1424
Schaefer, R. G., 76-1112
Schanzel, H., 76-1461
Schatmeyer, J. F., 76-0881
Scheufler, H., 76-1455
Schiff, J. A., 76-1286
Schimmel, S. C., 76-1266
Schmidt, C. G., 76-1310
Schneider, P., 76-1541, 76-1542
Schom, C. B., 76-1499, 76-1500
Schoor, W. P., 76-0891
Schulz, K. L., 76-1290
Schulz, K. R., 76-1243
Schumacher, H. J., 76-1265
Schuntner, C. A., 76-1248
Schwab, G. O., 76-0895
Schwartz, G. F., 76-1322
Schwarz, M., 76-1253
Schwarzenberg, L., 76-1299
Schwemmer, B. A., 76-1290
Scierski, A., 76-1326
Scordelis, S. L., 76-1530
Seehofer, F., 76-1571
Seguchi, K., 76-1335
Seguin, G., 76-1383
Sekiguchi, M., 76-1335
Sekiguchi, Y., 76-1547
Semoroz, J. L., 76-1151
Sethi, B. K., 76-1133
Shabelyansky, V. B., 76-1319
Shafik, T. M., 76-1113
Shakirov,T. T., 76-1405
Shankaranarayana, M. L., 76-1317
Shanks, V., 76-1555
Shapiro, B. I., 76-1199
Sharma, I. C., 76-1316
Sheets, T. J., 76-0853
Shih, C. C., 76-0910
Shimazaki, K., 76-1274, 76-1277 76-1278, 76-1451
Shimomura, H., 76-1446
Shirasu, Y., 76-1301
Shively, J. M., 76-1556
Shmigidina, A. M., 76-1327
Shoyama, M., 76-1578
Shtabskiy, B. M., 76-1525
Shtenberg, A. I., 76-1526
Shulyak, V. D., 76-1308
Sidhu, J. S., 76-1145
Sidwell, J. A., 76-1314
Siesennop, G. D., 76-1258
Silk, P. J., 76-0861
Siltanen, H., 76-1135
Simon, J. R., 76-1260
Simoneit, B. R., 76-1567
Sinclair, J. B., 76-1284
Singh, C. P., 76-1123
Singh, Y., 76-1529
Singhal, J. P., 76-1123
Singhal, R. L., 76-1211
Sketelj, J., 76-1310
Smead, C. F., 76-1585
Smirnova, S. N., 76-1563
Smith, A. E., 76-0876, 76-1242
Smith, D. H., 76-1567
Smith, L. L., 76-1480
Smith, L. L., Jr., 76-1258, 76-1259
Smusin, Ya. S., 76-1198
Soderlund, D. M., 76-1474
Sonnier, M., 76-1533, 76-1534
Sonntag, A. C., 76-1503
Sorber, C. A., 76-0911
Sosnov, Iu. D., 76-1300
Sotiriou, N., 76-1384
Soulier, Y., 76-1517
Sova, R. E., 76-1524
Spates, G. E., 76-1253
Sphon, J. A., 76-1478
Spiess, C., 76-1492
Sponzo, R., 76-1312
Spynu, E. I., 76-1436, 76-1524
Stafanska-Sulik, E., 76-1549
Stagg, G. V., 76-0864
Stahl, K. M., 76-1575
Stamatin, S. I., 76-1294
Stanescu, V., 76-1182
Starichkov, M. S., 76-1317
Steen, J. A., 76-1293
Stefanskiy, K. S., 76-0858, 76-1436
Stein, V. B., 76-1488
Sterrett, R. B., 76-1234
Steven, D., 76-1141
Stoetzer, H., 76-0927
Stone, W. H., 76-1308
Strezelec, A., 76-1186
Stringari, G., 76-1394
Strohmayer, A., 76-1471
Subramaniam, T. R., 76-1138
Sugimoto, T., 76-1557
Sugioka, K., 76-1579
Sundaram, K. M. S., 76-0854
Sundell, L., 76-1185
Sunshine, I., 76-1424
Suzuki, A., 76-1274

Suzuki, K., 76-1273
Svidritskaya, N. N., 76-1198
Svobodova, Z., 76-1210
Swift, J. E., 76-1103
Swineford, D. M., 76-1134
Szabo, Z., 76-1471
Szember, A., 76-1288
Szepan, B., 76-1301
Szokolay, A., 76-0873
Tafuri, F., 76-1147
Taha, S. M., 76-1224, 76-1225
Takahashi,A., 76-1446
Takahashi, R. M., 76-1291
Takamatsu, M., 76-1388
Takatani, O., 76-1305
Takayama, C., 76-1143
Takeda, M., 76-1339
Tanaka, M., 76-1305
Tanaka, T., 76-1452
Tate, K. G., 76-1409
Tavares, J., 76-1285
Taylor, A. W., 76-1370
Teitelman, U., 76-1423
Tepas, J. J., III, 76-1327
Terce, M., 76-1382
Terry, G., 76-1520
Terziev, G., 76-1167
Tewari, S. N., 76-1316
Thirumurthi, S., 76-1138
Thomas, J. F., 76-0882
Thompson, R. D., 76-1239
Thorstenson, J. H., 76-1152
Tildyova, K., 76-1422
Timmons, E. H., 76-0923
Tissier, J., 76-1551
Tobgy, A. H., 76-1222, 76-1223
Tobias, R. F., 76-0910
Todua, N. A., 76-1330
Tojo, K., 76-1486
Tokoro, T., 76-1273
Tomashiro, J., 76-1487
Tomio, T., 76-1450
Tomizawa, C., 76-0851
Toor, H. S., 76-1264
Toyama, N., 76-1579
Trakhtenberg, I. M., 76-1454
Trevino, J. L., 76-1252
Trivett, G., 76-1520
Truffert, L., 76-1518
Tsetlin, V. M., 76-1563
Tsipriyan, V. I., 76-0858
Tsubura, Y., 76-1446
Tsuchiya, H., 76-1411
Tsuji, H., 76-1446
Tu, C. M., 76-0926
Tulupova, V. G., 76-1307
Turakhodzhaev, M. T., 76-1405
Tyunyayeva, G. N., 76-1303
Ubaydullaev, A. Kh., 76-0857
Uchiyama, M., 76-1144, 76-1339
Ueda, K., 76-1474
Ueki, S., 76-1276
Uga, S., 76-1522
Unai, T., 76-1240
Unger, I., 76-0861
Urone, P., 76-0881
Uslenghi,C., 76-1318
Usui, N., 76-1429
Vadlamudi, V. P., 76-1489
Vaicum, L., 76-1309
Vainio, H., 76-0921
Vaisberg, A. J., 76-1286
Van de Kamp, C. G., 76-1326
Van der Maspel, G. J., 76-1409
Van Dijk, A., 76-0904
Van Hoof, F., 76-1168
Van Hook, R. I., 76-1511
Van Miller, J. P., 76-1521
Van Peteghem, C., 76-1168
Vancil, J. E., 76-1217
Vandekar, M., 76-1421
VanHeyst, A. N. P., 76-0904
Verma, B. C., 76-1332
Verma, D. C., 76-1285
Veronesi, U., 76-1313
Veylon, R., 76-1357
Villeneuve, D. C., 76-1228, 76-1230
76-1520
Vind, H. P., 76-0880, 76-1448
Viviani, R., 76-1479
Volans, G. N., 76-1164
Volk, V. V., 76-1159
Vollner, L., 76-1114
Volpe, Y., 76-1313
von Lieven, H., 76-1315
Von Rosen, G., 76-0850
Von Rumker, R., 76-0846
Vorob'eva, N. M., 76-1137
Voronkina, T.V., 76-1563
Vos, J. G., 76-1236
Vrochinskiy, K. K., 76-0859
Vukolova, V. V., 76-1294
Wahlstrom, B., 76-1459
Wakisaka, I., 76-0920, 76-1536
76-1558
Waldron, A. C., 76-0895
Walker, A., 76-1129
Walker, E. M., Jr., 76-1473
Walz, D. A., 76-1261
Wassom, J. S., 76-1090
Watanabe, T., 76-1446
Watson, A. P., 76-1511
Watson, M., 76-1576
Webb, R. G., 76-1591
Webber, J. B., 76-1158
Weber, J. B., 76-0866
Weber, K., 76-1156
Weber, T., 76-1553
Wecker, L., 76-1483
Weis, J. S., 76-1270
Weis, P., 76-1270
Weisgerber, I., 76-1384
Weiss, J. S. E. V., 76-1214
Weissmueller, J., 76-1467
Welsch, F., 76-1197
Welter, M., 76-1373
Wenger, B. S., 76-0924
Wesseling, A. C., 76-1249
Whitacre, D. M., 76-1290
White, J. L., 76-1368
White, R. K., 76-0895
Whitehead, P., 76-1379
Widdop, B., 76-1164
Wild, D., 76-1554
Wilder, E. L., 76-1195
Williams, I. H., 76-1379, 76-1490
Williams, J. H., 76-1148
Williams, P. M., 76-1117
Wilson, A. F., 76-1163
Wilson,C. B., 76-1048
Wilson, R. G., Jr., 76-0901
Winston, G. W., 76-1203
Wolfe, H. R., 76-0909
Wright, A. N., 76-1338
Wright, J. E., 76-1253
Wyatt, I., 76-1480
Yajima, T. W., 76-1574
Yamada, A., 76-1369
Yamagisawa, T., 76-1451
Yamaguchi, K., 76-1305
Yamaguchi, S., 76-1369
Yamashita, M., 76-1109
Yamashita, R., 76-1274
Yamazaki, H., 76-1274
Yamida, Y., 76-1437
Yanagisawa, T., 76-1275, 76-1276
76-1277, 76-1278
Yanase, R., 76-1579
Yaron, B., 76-1130
Yarotskiy, F. A., 76-1342
Yokoyama, T., 76-1143, 76-1178
Young, R. A., 76-1205
Young, R. C., 76-1040
Younger, R. L., 76-1188
Zabrodina, N. A., 76-1319
Zakirov, U. B., 76-1516
Zaytseva, L. D., 76-1308
Zbierska, J., 76-1393
Zeana, A., 76-1150
Zeana, R. C., 76-1150
Zein El-Abidin, A., 76-1222, 76-1223
Zhivetskii, A. V., 76-1320
Zimel, H., 76-1049
Zimmerli, B., 76-1333
Zucali, R., 76-1318
Zulawski, M., 76-1316
Zwierz, K., 76-0919

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